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EXAMINER	
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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/964,874
Filing Date: September 28, 2001
Appellent(s): SUZUKI ET AL.

EXAMINER'S ANSWER

Joseph L. Felber

For Appellant

MAILED

FEB 25 2005

Technology Center 2600

This is in response to the appeal brief filed 12/20/2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

The following ground(s) of rejection are applicable to appealed claims 10 & 11.

Claims 10-11 are rejected under 35 USC 103 (a) as being unpatentable over Kulakowski et al further considered with either Tsutsui or JP 08-306052.

Kulakowski et al teach in this environment the ability of having operational parameters set/established for initial set up – see the discussion with respect to figures 7 & 8, mode set up and default values.

Furthermore, Kulakowski et al also provide for various sensors, see col. 2 lines 60 plus.

Although various values are re-set, there is no specific mentioning of focus offset.

Either of the secondary references to Tsutsui of the above noted JP document (see the abstract thereof for instance) teaches in this environment the additional ability of correction/compensating for focus offset during temperature variations.

It would have been obvious to modify the base system of Kulakowski et al with the above teaching from either of the secondary references; motivation is to ensure proper system operation during variations in temperature.

Applicant as argued on 4/5/04,

a) there is no "resetting means" with respect to the "internal temperature of the disc drive" ,

b) the limitations of claim 11, focusing on the resetting ability with respect to the most recently measured temperature is also not found.

The examiner response to such in the final rejection as;

r-a) In Kulakowski et al, see col. 2 line 1 to col. 4 line 63 with respect to argument a above, and that a reference is evaluated for all that it teaches/discloses – see ***In re Bode et al, 193 USPQ 12.***

r-b) In Kulakowski et al, see col. 5, line 62 to col. 6 line 48, wherein the temperature is measured at various times (poll) and hence the most recent temperature is what establishes any need for correction, and hence the resetting of the previous established value is accomplished.

THE FOLLOWING EXPLODED ANALYSIS IS PRESENTED:

Claim 10	Kulakowski
An optical disk drive comprising:	see title and abstract
setting means for setting a focus offset value and/or a tracking offset value at startup of the optical disk drive;	see col. 2 line 61 till col. 3 line 16, the microprocessor is interpreted as such a device
first temperature measurement means for measuring an internal temperature of the optical disk drive at startup of the optical disk drive;	see col. 5, lines 3-26, element 12
second temperature measurement means for measuring an internal temperature the optical disk drive after startup of the optical disk drive;	see col. 5, lines 3-26, element 14
determination means for determining whether or not a difference between the temperature measured by the second temperature measurement means and the temperature measured by the first temperature measurement means has exceeded a predetermined level;	inherently present, see col. 5 line 27 to col. 6 line 48. Interpreted as part of the microprocessor
and	
resetting means for resetting the focus offset value and/or the tracking offset value set by the setting means when the determination means determines that the difference has exceeded the predetermined level.	inherently present, operation of microprocessor in reestablishing new operational parameters.

In the above Kulakowski et al system, the effects of temperature variations on disc drives is acknowledged. The examiner has interpreted the disclosure at col. 5 lines 3-17 as meeting the claimed determination means and function, i.e., when the measured temperature exceeds a first threshold. There must be a determination between two values in order to yield a conclusion that there is a difference. Although the threshold is not clearly defined, the examiner concludes that this is a first temperature established apriority by measuring a temperature of the system. Hence the examiner considers the threshold as meeting the claimed limitations with respect to the first measured temperature.

There is no clear depictions of resetting either focus or tracking offsets.

Tsutsui teaches at col. 1 line 38- 46 describe the effects of temperature upon offsetting servoing, focusing errors as well.

JP 08-306052 teaches the ability of having focus offset abilities responsive to temperature variations, see paragraph 29-39 of the MAT of this document.

(11)-2 Response to Arguments

Appellant's arguments on pages 8-10 of the brief focus on:

a) no focus offset ability provided for in Kulakowski et al

b) no reasons why such a reaction to temperature variations would be desirable in the Kulakowski et al system that already reacts to certain operations.

c) Claim 11 depends upon claim 10 and should be allowable for the reasons of its dependency.

d) Claim 11 further defines requires that the determining means

"difference between a temperature most recently measured .... and an immediately preceding temperature...". Not withstanding the above noted passages in Kulakowski et al, the "most recent temperature measurement" is not processed with the "immediately preceding temperature".

r-a) The rejection is based under 35 USC 103. The rejection identifies that the Kulakowski et al system lacks focus offset correction ability predicated upon temperature measurements.

Tsutsui teaches at the above noted passages the effects upon focus and track servoing.

JP 08-306052 also acknowledges – see the abstract of the MAT (machine assisted translation) the effects of temperature and focusing in optical systems – see paragraphs 29-39 of the MAT.

r-b) The examiner maintains that the references as a whole would lead one of ordinary skill in the art to meet the claimed limitations so as to correct for the effects of temperature variations, as recognized by all the secondary references upon focusing and track servoing, and hence lead one of ordinary skill in the art to include such in the Kulakowski et al system so as to provide for appropriate compensation of these system parameters and yield a properly operating system. The examiner concludes that this follows from the references and that under 35 USC 103 considerations render the claim subject matter met.

r-c) Dependent claim 11 falls with its parent claim.

r-d) The examiner interprets the operation of the above noted passages in the Kulakowski et al reference (as well as the disclosure starting at col. 6 line 16 to col. 8 line 54) and as noted in col. 6 lines 7-15 and col. 8 lines 30-49 as teaching measuring the difference between temperature parameters. The examiner concludes that this describes an operation in which the difference between the most recent temperature value and an immediately preceding temperature (which is variable set during a mode of operation) is performed.

(10)-3 Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims 12-13 and 26-27:

Claims 12-13 and 26-27 are rejected under 35 USC 103 (a) as obvious over Kulakowski et al further considered with either Takasugi or Davis.

Kulakowski et al is relied upon for the reasons stated above with respect to claims 10-11.

Either Takasugi or Davis, teach the additional ability of predicating corrections upon the output of the light emitting section as in Takasugi – see the discussion commencing at col. 1 lines 57-68, or as in Davis – see description with respect to figure 1 element 15.

It would have been obvious to modify the base system of Kulakowski e al with the above noted teachings from either of the secondary references, motivation is to appropriately compensate the laser output for temperature variations.

As further noted in the final rejection, Kulakowski dynamically varies the duty ratio of the laser drive. Hence such dynamic variation does control (resets) the output of the laser because such variation (duty cycle) controls the final laser output (on, off). As interpreted by the examiner the limitation, focusing upon controlling/resetting the laser output is then met.

The references as a whole teach the ability to compensate for the same problem – see decision/ citation in section (10)-2 above.

Since the primary reference acknowledges disturbances in operational temperature(s) cause(s) problems with the system operating correctly, and that either/both of the secondary references further

teach compensation for temperature variations, the combination of references as a whole meet the claimed limitations.

THE FOLLOWING EXPLODED ANALYSIS IS PRESENTED:

Claim 12	**Kulakowski et al**
An optical disk drive comprising:	see title and abstract
setting means for setting a laser output value of a light-emitting section, a laser being output from the light-emitting section for recording and/or reproducing data on and/or from an optical disk, at startup of the optical disk drive;	see col. 2 line 61 till col. 3 line 16, the microprocessor is interpreted as such a device
first temperature measurement means for measuring an internal temperature of the optical disk drive at startup thereof;	see col. 5, lines 3-26, element 12
second temperature measurement means for measuring an internal temperature of the optical disk drive after startup thereof;	see col. 5, lines 3-26, element 14
determination means for determining whether or not a difference between the temperature measured by the second temperature measurement means and	inherently present, see col. 5 line 27 to col. 6 line 48. Interpreted as part of the microprocessor

the temperature measured by the first temperature measurement means has exceeded a predetermined level; and	
resetting means for resetting the laser output value set by the setting means when the determination means determines that the difference has exceeded the predetermined level.	inherently present, operation of microprocessor in reestablishing new operational parameters

As noted in col. 5 lines 3-18, the system of Kulakowski et al varies the duty ratio of the output signal from the laser.

Takasugi in col. 1 lines 57-68 teach appropriate control of the laser and hence its output value predicated upon monitoring the laser appropriately.

Davis in figure 1 and its description of element 15 depicts appropriate monitoring of the laser temperature and appropriate feed back control thereto.

It would have been obvious to modify the base system of Kulakowski et al with either of the above teachings, motivation is to compensate for variations of the laser temperatures and reset the laser output in response thereto.

Claim 26	**Kulakowski et al**
An optical disk drive, comprising:	see title and abstract
a temperature sensor for sensing an internal temperature of the optical disk drive; and	sensors 12-14,and col. 5 lines 3-19
a controller for setting a laser output value	controller 40

of a light-emitting section, a laser being output from the light-emitting section for recording and/or reproducing data on and/or from an optical disk, wherein	see col. 6 lines 3-48
the controller sets the laser output value at startup of the optical disk drive, determines whether or not a difference between a temperature measured by the temperature sensor at startup of the optical disk drive and a temperature measured by the temperature sensor after startup of the optical disk drive has exceeded a predetermined level, and resets the laser output value when the difference is determined to have exceeded the predetermined level.	see above description in col. 6 lines 3-48

(11)-3 Response to Argument

Appellant's arguments on pages 11-13 of his brief focus on:

a-1) claim 12 recites

"resetting means for resetting the laser output value set by the setting means when the determination means determines that the difference has exceeded the predetermined level".

a-2) and that Kulakowski et al does not provide resetting the laser output value when the difference between two specified temperatures have exceeded a predetermined level.

b) The examiner has failed to identify a suitable suggestion in either of the secondary references.

c) The cited passage in Takasugi fails to discuss the resetting of a laser when the difference between two specified temperatures has been exceeded.

d) Claim 13 depends from clam 12.

e) Claim 26 includes a controller that

" ... resets the laser output value when the difference (between two specified temperatures) is determined to have exceeded the predetermined level".

f) Claim 27 depends from claim 26.

g) Claims 13 and 27 respectively describe a determination means and function thereof, and a controller and the function thereof, wherein these elements determine a difference between a temperature most recently measured and an immediately preceding measured temperature has exceeded a predetermined level, and no showing of such has been provided.

r-a) See claim 12 as noted above, wherein the determination means describes the difference requirement.

r-b) The passage in Takasugi has been provided.

r-c & e) Under 35 USC 103 considerations, it is not the physical insertion of elements of one reference into another that should be focused on, but rather what the teachings of both provide.

In the above combination, the Kulakowski et al reference provides for appropriate duty ratio variation(s) of the laser source as a result of the appropriate determination.

Takasugi provides for control of the laser output in response to monitoring of the laser for appropriate control. Further impact of duty ratio and power is described at col. 5 commencing at line 17 of Takasugi.

Davis as further elaborated in col. 2 line 48 to col. 3 line 10 describes the impact of laser temperature with respect to driving a laser output.

The secondary references were not relied upon to describe measuring a difference between two specified temperatures. They were relied upon for teaching the control of the laser output predicated upon the monitored conditions. Hence, the invention as a whole is considered met by the above combination of references as motivation to so combine is predicated upon controlling the laser in order to compensate for negative impacts due to temperature variations.

r-d&f) Dependent claims fall with their respective parent claim.

r-g) The examiner interprets the operation of the Kulakowski et al reference as described starting at col. 5 line 27 and continuing to col. 6 line 48 as well as the disclosure starting at col. 6 line 16 to col. 8 line 54 and as further noted in col. 6 lines 7-15 and col. 8 lines 30-49 as so meeting this requirement. The examiner interprets the above as teaching an operation in which the differences between the most recent temperature value and an immediately preceding temperature (which is variable set during a mode of operation) is performed.

(10)-4 Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claim 25:

Claim 25 is rejected under 35 USC 103 (a) as being obvious over JP 10-283,645 further considered with either Kulakowski et al or Takagi et al.

With respect to claim 25, although the controller/microprocessor in JP 10-283,645 provides for the appropriate control of the overall system, there is no clear description with respect to detecting the variations in temperature for a plurality of times so as to yield the limitations focusing on the most recently measured valued.

The Kulakowski et al system is interpreted as providing system operation control over different periods of time and hence providing for the "most recently" measured limitation, see col. 5 line 27 to col. 6 line 48 in Kulakowski et al. The examiner interprets the last polling event as meeting the most recent limitation.

Alternatively, Takagi et al at column16 line 7-60 describes a continuous measuring ability with respect to the temperature of the disc system (optical head) and provide for appropriate control thereof.

Hence the last provided feedback is the most recently measured temperature, and the immediate preceding one is the immediate preceding measured limitation.

It would have been obvious to modify the base system of JP 10-283,645 with the teaching from either of the above secondary systems, motivation is to provide a continuous feedback and hence provide for a dynamically controlled system.

THE FOLLOWING EXPLODED ANALYSIS IS PRESENTED:

Claim 25: The optical disk drive according to claim 24,	see above analysis with respect to Claim 24 and the base reference JP 10-283,645.	
	Kulakowski	Takagi
wherein the controller measures the temperature detected by the temperature sensor at given times, determines whether or not a difference between a most-recently measured temperature and a measured temperature immediately preceding the most-recently measured temperature has exceeded a predetermined level, and resets a set focus offset value and/or a set tracking offset value when the difference is determined to have exceeded a predetermined value.	col. 5 line 27 to col. 6 line 48	col. 16 lines 7-60

(11)-4 Response to Argument

Appellant's arguments as found on pages 14-15 focus on:

a) claim 25 requires the controller to determine a difference between the most recently measured temperature and the immediately preceding measured temperature, and as such it is not taught by the Takagi reference.

r-a) The examiner interprets the operation of the above noted passages in the Kulakowski et al reference (as well as the disclosure starting at col. 6 line 16 to col. 8 line 54) and as noted in col. 6 lines 7-15 as well as col. 8 lines 30-49.

The examiner concludes that this describes an operation in which the difference between the most recent temperature value and an immediately preceding temperature (which is variable set during a mode of operation) is performed.

Also, the examiner interprets the above disclosure of Takagi et al at col. 16 lines 7-60 to also Describe an operation in which the difference between the most recent temperature value as well as an Immediately preceding temperature is performed.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Aristotelis M Psitos
Primary Examiner
Art Unit 2653

AMP
February 17, 2005

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PATENT ABSTRACTS OF JAPAN

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(21)Application number : 09-099701 (71)Applicant : NIPPON COLUMBIA CO LTD

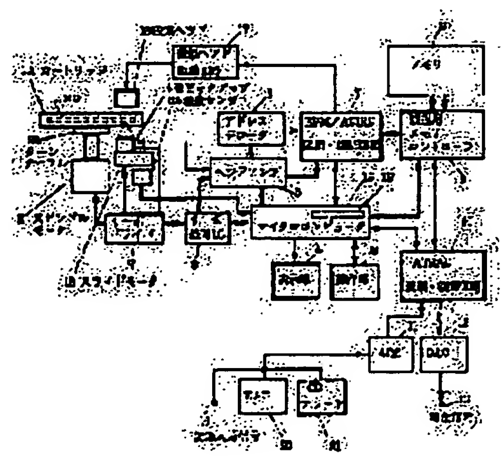
(22)Date of filing : 01.04.1997 (72)Inventor : OTSUKA JUN

(54) OPTICAL DISK DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an optical disk device capable of withstanding an extensive range of operating temps.

SOLUTION: In an optical disk device performing the automatic adjustment of a tracking offset, the device is provided with a detection means detecting the temp. change of the vicinity of an optical pickup 4, a storage means storing the control data of the tracking offset and a means adjusting the tracking offset by updating the set value of the tracking offset while reading out the control data stored in the storage means when a temp. deviates off the preliminarily set temps. As a result, since the device can perform the automatic adjustment of the tracking offset without interrupting an operation temporarily even when a remarkable temp. change is generated during the reproducing or the recording operation of an optical disk, the reproducing or the recording of the optical disk are continued in the extensive range of ambient temps.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]
[Claim 1] The optical disk unit which reproduces the signal which is characterized by providing the following, and which was recorded or recorded on the optical disk in the signal A temperature detection means to detect the temperature in equipment A storage means to memorize the control data which controls the tracking offset produced by the temperature gradient A means to read the control data memorized by the aforementioned storage means in the temperature detected by the aforementioned temperature detection means, to update a tracking offset setup, and to adjust tracking offset
[Claim 2] The optical disk unit which reproduces the signal which is characterized by providing the following, and which was recorded or recorded on the optical disk in the signal A temperature detection means to detect the temperature near the optical pickup A storage means to memorize the data which control the tracking offset produced by the temperature gradient A means to read the control data memorized by the aforementioned storage means of the temperature detected by the aforementioned temperature detection means, to update a setup of tracking offset, and to adjust tracking offset
[Claim 3] The optical disk unit which reproduces the signal which is characterized by providing the following, and which was recorded or recorded on the optical disk in the signal A temperature detection means to detect a temperature change from the regenerative signal which changes according to the temperature change near the optical pickup A storage means to memorize the data which control the tracking offset produced by the temperature gradient A means to read the control data memorized by the aforementioned storage means of the temperature detected by the aforementioned temperature detection means, to update a setup of tracking offset, and to adjust tracking offset

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to optical disk units, such as a CD player which can control tracking offset, and MD recorder.
[0002]
[Description of the Prior Art] A Prior art is explained based on a drawing. Drawing 4 is the block diagram showing the composition of the portion which adjusts tracking offset of the conventional optical disk unit, and drawing 5 is a flow chart which shows adjustment operation of the conventional tracking offset. Drawing 6 (a) is drawing in which the signal wave form and drawing 6 (b) before adjustment of tracking offset show the tracking error signal after adjustment.
[0003] Conventionally, an optical disk unit has the spindle motor 2 which carries out the rotation drive of the optical disk 1, and has the optical pickup 4 which reads the digital information recorded on the optical disk 1. The signal read by the optical pickup 4 is amplified with the head amplifier 5, processing of various servo signals, such as a focus servo, a TORASO king servo, a slide servo, and a spindle servo, constitutes it by the servo processing IC 3, and it is servo driver 3' which controls, operates a spindle motor 2 and an optical pickup 4, and performs record or reproduction of an optical disk 1.
[0004] The microphone ROKUN pewter (henceforth a microcomputer) 15 is a spindle motor to the servo processing IC 3. The instruction of operation for controlling each operation of 2 and an optical pickup 4 etc. is directed. The servo processing IC 3 once cancels a servo loop with the tracking offset adjustment command sent from a microcomputer 15, detects DC component of the tracking error signal produced by the temperature characteristic of the detector sensitivity of an optical pickup 4 etc., and sends the detected result to a microcomputer 15.
[0005] A microcomputer 15 sends the control data for canceling DC component of a tracking error signal to the servo processing IC 3 based on the detection result sent from the servo processing IC 3, and the servo processing IC 3 sets up a servo value by the sent control data, and it sends it to the head amplifier 5. It accomplishes with a tracking error signal without DC component after adjusting a tracking error signal with the DC component V2 before adjustment, adjustment of tracking offset is ended, and it goes into record or reproduction operation.
[0006] The flow chart which shows TORASO king offset adjustment operation to drawing 5 explains. In order to adjust tracking offset in starting record or reproduction, a microcomputer 15 once turns OFF a tracking servo (S11).
[0007] The DC component V2 of the amplitude V1 of the tracking error signal outputted from the head amplifier 5 is detected, and it is bias voltage to the servo processing IC 3. - It orders so that V2 may be added and the DC component V2 may be canceled, and the head amplifier 5 adjusts tracking offset to 0 so that it may be shown at the time of normal of drawing 6 (b) (S12). A tracking servo is turned on (S13) and record or reproduction is started (S14).
[0008] While record or reproduction operation will be continued, the temperature inside an optical disk unit rises, or when it is a portable type, it is warmed by the temperature change of the open air etc., or it

will be cooled, offset voltage will overflow of operation tolerance**V3 (about 15% of V1), a tracking servo will separate, DC component V2' of drawing 6 (b) will arise, and a tracking servo will stop operating. Although a reproduction state is turned OFF, and a reproduction operation may be carried out if offset adjustment operation is performed again when it becomes reproduction impotentia by the temperature change, it is difficult in carrying out by coefficient amendment of regular 1 and accomplishing with a product the control loop of the tracking servo which can maintain reproduction operation in a reproduction operation region, for example, temperature width of face of -10 degrees C - 40 degrees C.

[0009]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional technology, although adjustment accomplished only at once in order that adjustment of tracking offset might turn OFF a servo loop and might carry it out at the time of the start of reproduction operation or record operation, it was not readjusted during reproduction operation or record operation after that. reproduction of the signal recorded or recorded on the optical disk in the signal by it being alike, passing after an adjustment end, the ambient temperature near the optical pickup rising, the state where the tracking offset by the appropriate thing [that temperature changes sharply] cannot be amended arising, and tracking offset becoming large by the variation in an optical pickup etc. -- on the way -- it came out and there was a problem which becomes impossible

[0010]

[Means for Solving the Problem] this invention is the optical disk unit provide a means read the control data memorized by a temperature detection means detect the temperature in equipment, a storage means memorize the control data which controls the tracking offset produced by the temperature gradient, and the aforementioned storage means of the temperature detected by the aforementioned temperature detection means in the optical disk unit which reproduces the signal recorded or recorded on the optical disk in the signal, update a setup of tracking offset, and adjust tracking offset.

[0011] Moreover, this invention is set to the optical disk unit which reproduces the signal recorded or recorded on the optical disk in the signal. A temperature detection means to detect the temperature near the optical pickup, and a storage means to memorize the data which control the tracking offset produced by the temperature gradient, It is an optical disk unit possessing a means to read the control data memorized by the aforementioned storage means of the temperature detected by the aforementioned temperature detection means, to update a setup of tracking offset, and to adjust tracking offset.

[0012] Moreover, this invention is set to the optical disk unit which reproduces the signal recorded or recorded on the optical disk in the signal. A temperature detection means to detect a temperature change from the regenerative signal which changes according to the temperature change near the optical pickup, A storage means to memorize the data which control the tracking offset produced by the temperature gradient, It is an optical disk unit possessing a means to read the control data memorized by the aforementioned storage means of the temperature detected by the aforementioned temperature detection means, to update a setup of tracking offset, and to adjust tracking offset.

[0013]

[Embodiments of the Invention] A drawing explains one example of this invention. Drawing 1 is the block diagram showing MD (mini disc) recorder of one example of the optical disk unit of this invention. Operation which uses a mini disc (MD) as an optical disk, and is reproduced and recorded is explained. MD1 is contained in cartridge 1A, and it is equipped with it on turntable 2B by carrying out loading of the cartridge 1A into MD recorder. Within cartridge 1A, on turntable 2B, MD1 fixes in a core and a rotation drive is carried out by the spindle motor 2.

[0014] The shutter formed in cartridge 1A is opened at the time of wearing, an optical pickup 4 and the magnetic head 16 slide on the shaft orientations of MD1 by the slide motor 18, and record reproduction of a signal is performed to the predetermined truck of MD1.

[0015] When recording a signal on MD1, it switches so that the magnetic head 16 may generate the magnetic field of NS pole corresponding to the record signal in the laser beam irradiation and the magnetic-head drive circuit 17 by the optical pickup 4, and a signal is recorded.

[0016] A record input signal is inputted from the input edge 14, a digital audio tape recorder (DAT), or (compact disk CD) player 21 grade. It is changed into a digital signal with an analog-digital converter (ADC) 11. It stores temporarily one by one. a digital signal carries out time base compaction by the ATRAC (Adaptive Transform Acoustic Coding) modulation and the demodulator circuit 10 -- having -- the memory controller 8 for **-proof -- minding -- a period predetermined to the memory 9 as buffer memory -- EFM () [Eight to Fourteen] The record signal which suited the record format by the Modulation/ACIRC (Adaptive Cross Interleave Read-solomon Code) modulation and the demodulator circuit 7 becomes irregular. the magnetic-head drive circuit 17 While minding and sending a record signal to the magnetic head 16, it is controlled by the system controller (microcomputer) 15, and reproduction or a record output is supplied to an optical pickup 4 through the head amplifier 5. The magnetic head 16, an optical pickup 4, and a spindle motor 2 are controlled through the servo processing IC 3 and servo driver 3', and record accomplishes them to a predetermined truck.
[0017] Next, reproduction operation is explained. The signal recorded on the predetermined truck of MD1 is changed into an electrical signal by the optical pickup 4, and is amplified with the head amplifier 5. The roll control of MD1 and tracking-servo control of an optical pickup 4 are performed by the microcomputer (henceforth a microcomputer) 15 through the servo processing IC 3 and servo driver 3'.
[0018] It gets over by the EFM/ACIRC modulation and the demodulator circuit 7 through the address recorder 6, and the regenerative signal amplified with the head amplifier 5 is stored temporarily through the memory controller 8 for **-proof to the memory 9 of buffer memory.
[0019] It gets over to the signal in which was sent to the ATRAC modulation and the demodulator circuit 10 by the system controller 15 through the memory controller 8 for **-proof, and time-axis extension was carried out by the demodulator circuit, and the signal stored temporarily in memory 9 is changed into an analog signal by the digital to analog converter (DAC) 12, and is outputted from an outgoing end 13.
[0020] If it directs that reproduction operation carries out continuation reproduction of the N truck (N music) from a control unit 22 to M truck (M music) and a degree, after reproducing Truck M and requiring search-time S, reproduction of Truck N is started. A fixed time interval is prepared and reproduction usually accomplishes so that music Mabe by whom connection reproduction of M music and the N music is not done may be prepared. To the data currently recorded on the truck, it has a time entry, and the time-axis of the recorded signal is reconstructed at the time of reproduction, and an informational continuity is held.
[0021] The display of the content which makes a microcomputer 15 operate by key strokes, such as a key switch of a control unit 22, to the display 19 prepared in the panel section of MD recorder accomplishes.
[0022] The data by which time base compaction was carried out are recorded on MD for every truck. Usually, when Truck N is specified to be the degree of Truck M from a control unit 22 and it reproduces, the signal of the disk top of MD1 and each truck is Truck M... Truck N etc. is recorded.
[0023] Temperature sensor 3A is prepared in the frame of an optical pickup 4. The data detected by the temperature sensor are inputted into a microcomputer 15, and temperature is detected. The temperature requirement by which the control data beforehand doubled with the temperature characteristic of tracking offset of an optical pickup 4 was decided to be memory 15' in a microcomputer 15 is taken charge of, and it memorizes. For example, according to the contents of storage which are shown in drawing 3 and which were beforehand memorized by memory, the data which negate DC component of a tracking error signal are read with a microcomputer 15, data processing is carried out by the servo processing IC 3, and the tracking servo of the optical pickup is carried out with the head amplifier 5.
[0024] Next, the flow chart shown in drawing 2 explains change operation controlled according to the temperature in the equipment of tracking offset of the optical pickup 4 in MD recorder of this example. When MD recorder is in record or a reproduction state, a microcomputer 15 carries out temperature detection from temperature sensor 3A by the regular time interval (S1), incorporates the detected data on a microcomputer 15, distinguishes a part for which temperature requirement or a temperature province,

distinguishes the present temperature, and memorizes it to memory 15' (S2).
[0025] A microcomputer 15 sets up the data which read the control data in the present temperature (S3), input into the servo processing IC 3, and negate offset from the control data beforehand memorized by memory 15' as control data of the tracking offset which is adapted for the optical pickup 4 used for every temperature requirement beforehand, as it is shown in drawing 3 in order to negate offset for example, and it updates tracking offset control through the head amplifier 5 (S4).
[0026] MD recorder -- record or reproduction -- whenever a fixed period passes whenever the temperature detected by temperature sensor 3A exceeds working (S5) and the predetermined range and it changes or, it returns to S1 and updating control of tracking offset is repeated (S6) When it remains as it is and it ends, when there is no change in temperature and it is ended, and record or reproduction is continued, it returns to S5 and supervises whether the detection temperature of S6 changed.
✓ [0027] Since MD recorder is performed by the data with which time base compaction of record and the reproduction was carried out, a microcomputer 15 Record or reproduction Or when the temperature requirement with which detected temperature even if it was [record] under reproduction, and temperature was remembered to be by memory 15' and which was decided beforehand respectively is exceeded, A temperature change can be detected, tracking offset data can be read from memory 15', tracking offset data can always be updated without cutting a tracking servo loop, and offset of a control loop can be made to follow a temperature change.
[0028] Furthermore, in other examples, a storage means by which the data memorized even if it shut off the power supply by memory 15' which prepares temperature sensor 3A which measures the circumference of an optical pickup 4 and nearby temperature to the optical disk unit which has the automatic regulation function of tracking and, by which the power supply was backed up are not eliminated is established.
[0029] When memory 15' memorizes as the temperature of an optical pickup 4 and the control data of tracking offset show drawing 3 , and an optical disk unit operates after shipment beforehand to it at the time of factory shipments, When it is compared with the temperature about four-optical pickup temperature was remembered to be by temperature sensor 3A at memory 15' and a temperature change is detected, a fixed time interval is prepared, and a microcomputer 15 reads control data from memory 15', and performs the automatic regulation of tracking-off SESOTO.
[0030] When it changes more than the temperature for each temperature province by which the temperature around an optical pickup 3 was beforehand recorded on memory 15' according to the - example mentioned above, In order to change the automatic regulation set point of tracking offset, it is not necessary to cut a control loop and to measure DC component. Reproduction record of an optical disk can be continued without interrupting reproduction record of an optical disk, since control data can be immediately read to temperature considerable the bottom, tracking offset can be amended and a truck servo can be carried out.
[0031] Moreover, as shown in drawing showing the example of variation over the temperature change of DC offset voltage of the tracking error signal of an optical pickup shown in drawing 7 , the temperature characteristic produced from the mechanism of the supporter of an optical pickup and the temperature characteristic by electrical parts, such as a semiconductor used for the photodetection section, are compounded, and the control data in the temperature requirement decided beforehand produces change in an offset value. Therefore, a microcomputer 15 can raise the precision of peculiar offset control for every optical pickup by investigating a property and making the variation to it also making it possible to adjust a control loop gain, it carrying out DC addition with control of offset, tracking offset being amended, and the usable temperature requirement of equipment being expanded, and temperature-change property far-reaching for every product memorize beforehand respectively.
[0032] Optical disk reproduction record can be carried out without according to this invention, interrupting optical disk reproduction record, even if a temperature change is during optical disk reproduction record.
[0033] In addition, although the example which performs an automatic regulation by controlling the head amplifier 5 for the automatic regulation of tracking offset as an example was described, the head

amplifier 5 cannot be controlled but it can carry out similarly about the optical disk unit which performs the automatic regulation of tracking offset only by internal-arithmetic processing of the servo processing IC 3.

[0034]

[Effect of the Invention] Since according to the optical disk unit of this invention the automatic regulation of tracking offset is performed, without interrupting optical disk reproduction or record operation temporarily even if a temperature change is during reproduction of an optical disk, or record operation, the equipment which continues and operates by the latus temperature requirement can be obtained.

[Translation done.]

* NOTICES *

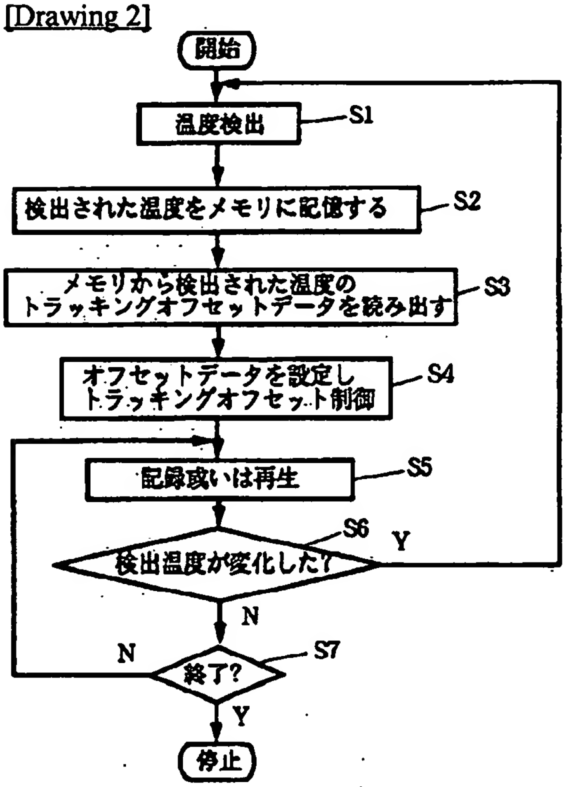
DRAWINGS

[Drawing 3]

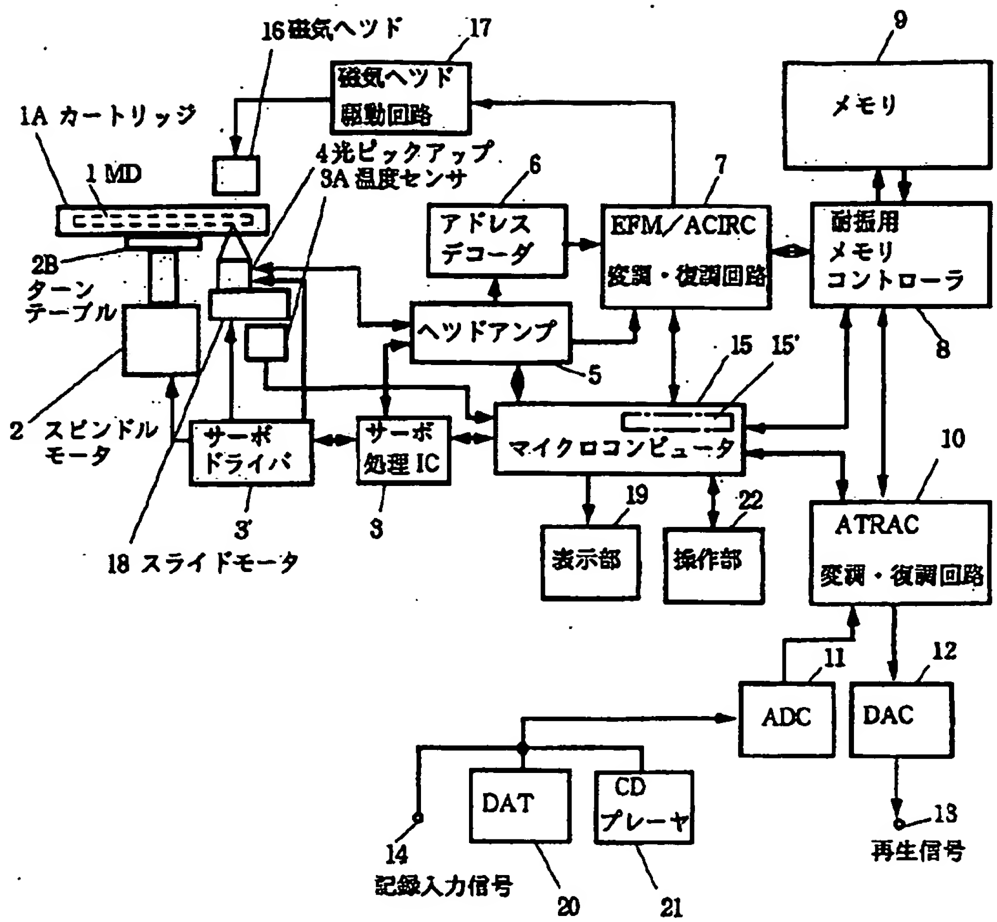
予めメモリに記憶された内容

温度	制御データ
−20〜−10	0101
−10〜0	0110
0〜10	0111
10〜20	1000
20〜30	1001
30〜40	1010
40〜50	1011

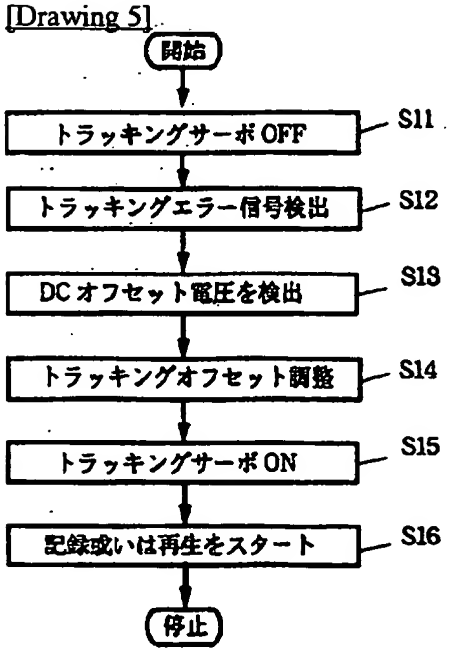
[Drawing 2]



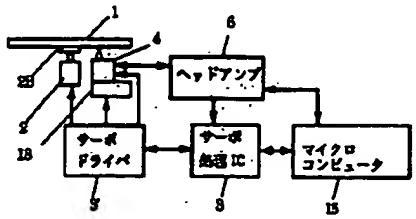
[Drawing 1]



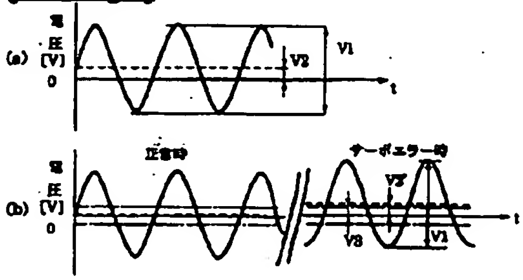
[Drawing 5]



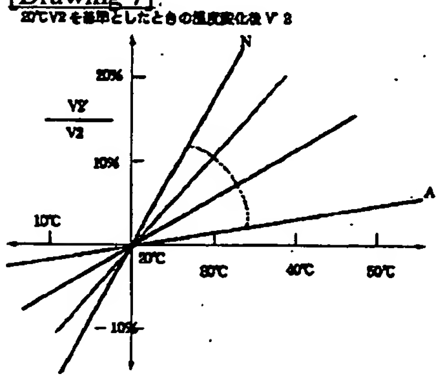
[Drawing 4]



[Drawing 6]



[Drawing 7]



[Translation done.]

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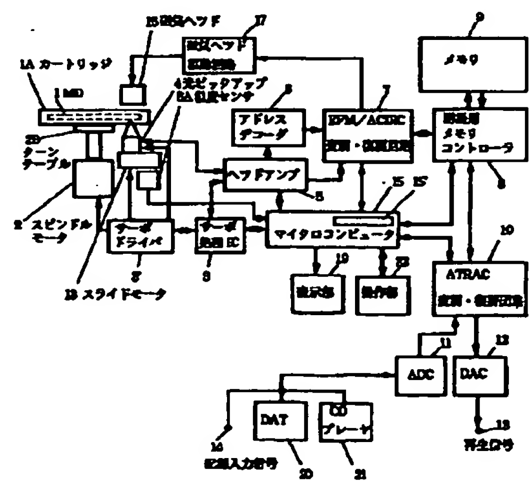
(54)【発明の名称】　光ディスク装置

(57)【要約】

【課題】　広範囲の使用温度に耐えることができる光ディスク装置を得る。

【解決手段】　トラッキングオフセットの自動調整をする光ディスク装置において、光ピックアップの近傍の温度変化を検出する検出手段と、トラッキングオフセットの制御データを記憶する記憶手段と、予めきめられた温度から外れた温度が検出された時記憶手段に記憶された制御データを読みだし、トラッキングオフセット設定値を更新してトラッキングオフセット調整する手段を具備するので光ディスクの再生或いは記録動作中に大幅な温度変化があっても、動作を一時中断することなくトラッキングオフセットの自動調整を行うことができるので広い範囲の周囲温度で光ディスク再生或いは記録を続行することができる。



【特許請求の範囲】

【請求項１】　光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、装置内の温度を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御する制御データを記憶する記憶手段と、前記温度検出手段によって検出された温度における前記記憶手段に記憶された制御データを読みだしトラッキングオフセット設定を更新してトラッキングオフセットを調整する手段を具備することを特徴とする光ディスク装置。

【請求項２】　光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、光ピックアップの近傍の温度を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御するデータを記憶する記憶手段と、前記温度検出手段によって検出された温度の前記記憶手段に記憶された制御データを読みだしトラッキングオフセットの設定を更新してトラッキングオフセットを調整する手段を具備することを特徴とする光ディスク装置。

【請求項３】　光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、光ピックアップの近傍の温度変化に応じて変化する再生信号から温度変化を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御するデータを記憶する記憶手段と、前記温度検出手段によって検出された温度の前記記憶手段に記憶された制御データを読みだしトラッキングオフセットの設定を更新してトラッキングオフセットを調整する手段を具備することを特徴とする光ディスク装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、トラッキングオフセットの制御が可能なＣＤプレーヤ及びＭＤレコーダ等の光ディスク装置に関するものである。

【０００２】

【従来の技術】従来の技術について、図面をもとに説明する。図４は、従来の光ディスク装置のトラッキングオフセットを調整する部分の構成を示すブロック図で、図５は、従来のトラッキングオフセットの調整動作を示すフローチャートである。図６（ａ）はトラッキングオフセットの調整前の信号波形及び図６（ｂ）は調整後のトラッキングエラー信号を示す図である。

【０００３】従来、光ディスク装置は、光ディスク１を回転駆動するスピンドルモータ２を有し、光ディスク１に記録されたデジタル情報を読み取る光ピックアップ４を有する。光ピックアップ４で読み取った信号は、ヘッドアンプ５で増幅され、サーボ処理ＩＣ３によりフォーカスサーボ、トラッキングサーボ、スライドサーボ、スピンドルサーボ等の各種サーボ信号の処理が成され、制御を行うサーボドライバ３’で、スピンドルモータ２及び光ピックアップ４を動作させ、光ディスク１の記録或いは再生を行う。

【０００４】マイクロクンピュータ（以下マイコンと言う）１５は、サーボ処理ＩＣ３に対して、スピンドルモータ　２と光ピックアップ４の各動作を制御するための動作命令等の指示をする。サーボ処理ＩＣ３は、マイコン１５から送られるトラツキングオフセツト調整コマンドによって、一旦サーボループを解除し、光ピックアップ４のデイテクタ感度の温度特性等によって生じるトラッキングエラ信号のＤＣ成分を検出し、検出した結果をマイコン１５に送る。

【０００５】マイコン１５はサーボ処理ＩＣ３から送られた検出結果に基づき、トラッキングエラー信号のＤＣ成分をキャンセルするための制御データをサーボ処理ＩＣ３に送り、サーボ処理ＩＣ３は送られた制御データによりサーボ値を設定し、ヘッドアンプ５へ送る。調整前のＤＣ成分Ｖ２をもったトラッキングエラ信号を調整後のＤＣ成分のないトラッキングエラ信号と成し、トラッキングオフセットの調整を終了し、記録或いは再生動作に入る。

【０００６】トラツキングオフセット調整動作を図５に示すフローチャートにより説明する。記録或いは再生を開始するにあたりトラッキングオフセットの調整をするために、マイコン１５は、トラッキングサーボを一旦ＯＦＦにする（Ｓ１１）。

【０００７】ヘッドアンプ５から出力されるトラッキングエラー信号の振幅Ｖ１のＤＣ成分Ｖ２を検出しサーボ処理ＩＣ３にバイアス電圧－Ｖ２を加えてＤＣ成分Ｖ２のキャンセルをするように指令し、ヘッドアンプ５でトラッキングオフセットを図６（ｂ）の正常時に示すように０に調整する（Ｓ１２）。トラッキングサーボをＯＮし（Ｓ１３）、記録或いは再生をスタートする（Ｓ１４）。

【０００８】記録或いは再生動作が継続されるうちに、光ディスク装置の内部の温度が上昇し、或いはポータブルタイプの場合、外気の温度変化等により暖められ、或いは冷やされてオフセット電圧が動作許容範囲±Ｖ３（Ｖ１の約１５％）からはみ出し、トラッキングサーボが外れ図６（ｂ）のＤＣ成分Ｖ２’が生じトラッキングサーボが作動しなくなってしまう。温度変化により再生不能になった場合、再生状態をＯＦＦにして、再度オフセット調整動作を行えば再生作動をする場合もあるが、再生動作域の例えば－１０℃～４０℃の温度幅における再生動作を維持することができるトラッキングサーボの制御ループを、決まった一の係数補正にて行い製品と成すのは難しい。

【０００９】

【発明が解決しようとする課題】しかしながら、上記従来技術ではトラッキングオフセットの調整が再生動作、或いは記録動作のスタート時に、サーボループをＯＦＦ

にして実施しなければならないために、一度だけ調整が成されるものの、その後再生動作、或いは記録動作中は、再調整されることはなかった。然るに、調整終了後、時間が経過し、光ピックアップ近傍の周辺温度が上昇し、温度が大幅に変化することによるトラッキングオフセットを補正することができない状態が生じ、光ピックアップのバラツキ等によっては、トラッキングオフセットが大きくなって、光ディスクに信号を記録、或いは記録された信号の再生が途中でできなくなってしまう問題があった。

【0010】

【課題を解決するための手段】本発明は、光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、装置内の温度を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御する制御データを記憶する記憶手段と、前記温度検出手段によって検出された温度の前記記憶手段に記憶された制御データを読みだしトラッキングオフセットの設定を更新してトラッキングオフセットを調整する手段を具備する光ディスク装置である。

【0011】また、本発明は、光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、光ピックアップの近傍の温度を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御するデータを記憶する記憶手段と、前記温度検出手段によって検出された温度の前記記憶手段に記憶された制御データを読みだしトラッキングオフセットの設定を更新してトラッキングオフセットを調整する手段を具備する光ディスク装置である。

【0012】また、本発明は、光ディスクに信号を記録或いは記録された信号を再生する光ディスク装置において、光ピックアップの近傍の温度変化に応じて変化する再生信号から温度変化を検出する温度検出手段と、温度差によって生じるトラッキングオフセットを制御するデータを記憶する記憶手段と、前記温度検出手段によって検出された温度の前記記憶手段に記憶された制御データを読みだしトラッキングオフセットの設定を更新してトラッキングオフセットを調整する手段を具備する光ディスク装置である。

【0013】

【発明の実施の形態】本発明の一実施例を図面により説明する。図1は本発明の光ディスク装置の一実施例のMD（ミニディスク）レコーダを示すブロック図である。光ディスクとしてミニディスク(MD)を用いて再生、記録する動作を説明する。MD1はカートリッジ1A内に収納され、カートリッジ1AをMDレコーダ内にローディングすることによって、ターンテーブル2Bの上に装着される。カートリッジ1A内でMD1は、ターンテーブル2Bの上に中心部で固着されてスピンドルモータ2によって回転駆動される。

【0014】カートリッジ1Aに設けられたシャッタが装着時に開かれ、光ピックアップ4及び磁気ヘッド16がMD1の軸方向にスライドモータ18によって摺動され、MD1の所定のトラックへ信号の記録再生が行われる。

【0015】MD1に信号を記録する場合には、光ピックアップ4によるレーザビーム照射と磁気ヘッド駆動回路17で磁気ヘッド16が記録信号に対応したNS極の磁界を発生するように切り換え信号が記録される。

【0016】記録入力信号が入力端14又はデジタルオーディオテープレコーダ(DAT)又はコンパクトディスク(CD)プレーヤ21等から入力され、アナログデジタルコンバータ(ADC)11でデジタル信号に変換され、ATRAC(Adaptive Transform Acoustic Coding)変調・復調回路10でデジタル信号が時間軸圧縮されて耐振用メモリコントローラ8を介しバッファメモリとしてのメモリ9に所定の期間順次一時記憶され、EFM(Eight to Fourteen Modulation)／ACIRC(Adaptive Cross Interleave Read-solomon Code)変調・復調回路7で記録フォーマットに合った記録信号に変調されて磁気ヘッド駆動回路17を介し磁気ヘッド16へ記録信号が送られると共に、システムコントローラ（マイクロコンピュータ）15で制御されてヘッドアンプ5を介し光ピックアップ4へ再生又は記録出力が供給される。磁気ヘッド16及び光ピックアップ4並びにスピンドルモータ2はサーボ処理IC3及びサーボドライバ3'を介して制御され、所定のトラックへ記録が成される。

【0017】次に、再生動作を説明する。MD1の所定のトラックへ記録された信号は光ピックアップ4で電気信号に変換されヘッドアンプ5で増幅される。MD1の回転制御及び光ピックアップ4のトラッキングサーボ制御は、マイクロコンピュータ（以下マイコンと言う）15によりサーボ処理IC3及びサーボドライバ3'を介して行われる。

【0018】ヘッドアンプ5で増幅された再生信号はアドレスレコーダ6を介しEFM／ACIRC変調・復調回路7で復調されて耐振用メモリコントローラ8を介しバッファメモリのメモリ9へ一時記憶される。

【0019】メモリ9に一時記憶された信号はシステムコントローラ15によって耐振用メモリコントローラ8を介してATRAC変調・復調回路10へ送られて復調回路によって時間軸伸張された信号に復調されてデジタルアナログ変換器(DAC)12によりアナログ信号に変換されて出力端13より出力される。

【0020】再生操作は、操作部22からMトラック(M曲)、次にNトラック(N曲)を連続再生するように指示すると、トラックMを再生した後サーチ時間Sを要した後トラックNの再生が開始される。M曲とN曲とが連結再生されない曲間部を設けるように一定の時間間隔が設けられ通常再生が成される。トラックに記録されてい

るデータには時刻情報を有し、記録された信号の時間軸が再生時再構築され情報の連続性が保持される。

【0021】MDレコーダのパネル部に設けられた表示部19に操作部22のキースイッチ等のキー操作によってマイコン15を動作せしめる内容の表示が成される。

【0022】MDには、時間軸圧縮されたデータがトラック毎に記録される。通常トラックMの次にトラックNを操作部22から指定し、再生するとMD1のディスク上、各トラックの信号は、トラックM・・・トラックN等が記録される。

【0023】光ピックアップ4のフレームに温度センサ3Aが設けられる。温度センサで検出されるデータはマイコン15に入力され温度が検出される。マイコン15内のメモリ15'に予め光ピックアップ4のトラッキングオフセットの温度特性に合わせた制御データが決められた温度範囲を受け持ち記憶されている。例えば図3に示す予めメモリに記憶された記憶内容に従って、トラッキングエラー信号のDC成分を打ち消すデータがマイコン15により読み出され、サーボ処理IC3でデータ処理されてヘッドアンプ5で光ピックアップがトラッキングサーボされる。

【0024】次に、図2に示すフローチャートにより、本実施例のMDレコーダにおける光ピックアップ4のトラッキングオフセットの装置内の温度に応じ制御する切替動作を説明する。MDレコーダが記録あるいは再生状態のとき、マイコン15は、決まった時間間隔で温度センサ3Aから温度検出をし（S1）、検出されたデータをマイコン15に取り込み、どの温度範囲か温度区分を判別し現在の温度を判別しメモリ15'に記憶する（S2）。

【0025】マイコン15は、オフセットを打ち消すため、例えば図3に示すように予め温度範囲毎に、使用される光ピックアップ4に適応するトラッキングオフセットの制御データとして予めメモリ15'に記憶された制御データから、現在温度における制御データを読みだし（S3）、サーボ処理IC3に入力してオフセットを打ち消すデータを設定し、ヘッドアンプ5を介しトラッキングオフセット制御を更新する（S4）。

【0026】MDレコーダが記録或いは再生動作中（S5）、温度センサ3Aで検出される温度が所定の範囲を越え変化する度に或いは一定期間経過する毎にS1に戻りトラッキングオフセットの更新制御を繰り返す（S6）。温度に変化が無く終了される場合は、そのままで終了し、記録或いは再生が継続される場合は、S5に戻り、S6の検出温度が変化したかどうかを監視する。

【0027】MDレコーダは、記録及び再生が時間軸圧縮されたデータによって行われるので、マイコン15は、記録或いは再生又は、記録再生中であっても温度を検出し、温度がメモリ15'に記憶された各々予め決められた温度範囲を越えた場合、温度変化を検出し、メモリ15'からトラッキングオフセットデータを読みだし、トラッキングサーボループを切らないで常時トラッキングオフセットデータを更新して制御ループのオフセットを温度変化に追従させることができる。

【0028】さらに、他の実施例では、トラッキングの自動調整機能を有する光ディスク装置に光ピックアップ4の周囲、近傍の温度を測定する温度センサ3Aを設け、また、電源がバックアップされたメモリ15'で電源を切っても記憶されたデータが消去されない記憶手段を設ける。

【0029】メモリ15'には、予め工場出荷時、光ピックアップ4の温度とトラッキングオフセットの制御データが図3に示すごとく記憶され、出荷後、光ディスク装置が作動されるとき、光ピックアップ4近傍の温度が温度センサ3Aによってメモリ15'に記憶された温度と比較され、温度変化が検出されたとき、或いは一定の時間間隔を設けマイコン15は制御データをメモリ15'から読みだしトラッキングオフセソトの自動調整を行う。

【0030】上述した一実施例によれば、光ピックアップ3の周囲の温度が予めメモリ15'に記録された各温度区分の温度以上に変化した場合、トラッキングオフセットの自動調整設定値の変更を行うために制御ループを切りDC成分を測定する必要がなく、直ちに温度に相当した制御データを読みだし、トラッキングオフセットの補正をし、トラックサーボを実施することができるので、光ディスクの再生記録を中断することなく、光ディスクの再生記録を継続することができる。

【0031】また、予め決められた温度範囲における制御データは、図7に示す光ピックアップのトラッキングエラー信号のDCオフセット電圧の温度変化に対するバラツキ例を示す図のように、光ピックアップの支持部のメカニズムから生じる温度特性と光検出部に使用される半導体等の電気部品による温度特性が合成されてオフセット値に変化を生じる。したがって、マイコン15は、オフセットの制御と共に制御ループゲインを加減することも可能とし、DC付加してトラッキングオフセットの補正をし、装置の使用可能温度範囲を拡大して、また製品毎の温度変化特性A～Nの広範囲にわたるバラツキを各々予め特性を調べ記憶させることで光ピックアップ毎の固有のオフセット制御の精度を向上させることが可能である。

【0032】本発明によると、光ディスク再生記録中に温度変化があっても、光ディスク再生記録を中断することなく、光ディスク再生記録を実施することができる。

【0033】なお、実施例として、トラッキングオフセットの自動調整をヘッドアンプ5を制御することによって自動調整を行う例について述べたが、ヘッドアンプ5を制御せず、サーボ処理IC3の内部演算処理のみでトラッキングオフセットの自動調整を行う光ディスク装置

についても同様に行うことができる。

【0034】

【発明の効果】本発明の光ディスク装置によれば、光ディスクの再生或いは記録動作中に温度変化があっても、光ディスク再生或いは記録動作を一時中断することなくトラッキングオフセットの自動調整を行うので広い温度範囲で継続して動作する装置を得ることができる。

【図面の簡単な説明】

【図1】本発明の光ディスク装置の一実施例を示すブロック図。

【図2】本発明の光ディスク装置の動作を示すフローチャート。

【図3】本発明のマイクロコンピュータに記憶されたメモリ記憶内容の一実施例を示す図。

【図4】従来の光ディスク装置のトラッキングサーボ回路部を示すブロック図。

【図5】従来の光ディスク装置のフローチャート。

【図6】従来のトラッキングエラ信号のDCオフセットを示す図。

【図7】光ピックアップのトラッキングエラー信号のDCオフセット電圧の温度変化しに対するバラツキ例を示す図。

【符号の説明】

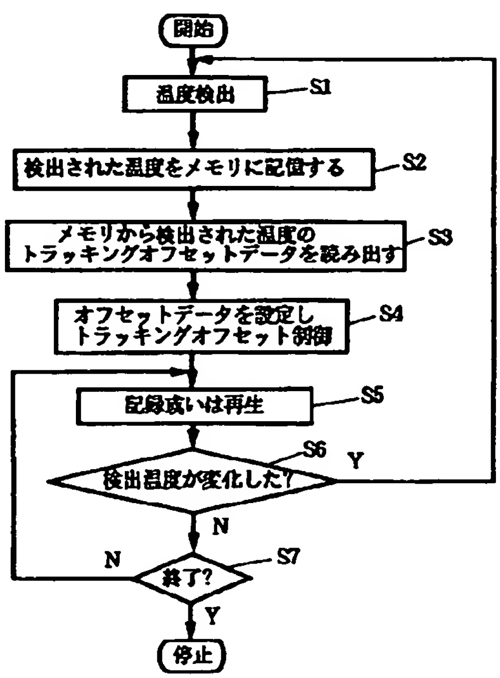
1　MD
1A　カートリッジ
2　スピンドルモータ
2B　ターンテーブル
3　サーボ処理IC
3'　サーボドライバ
4　光ピックアップ
5　ヘッドアンプ
6　アドレスレコーダ
7　EFM／ACIRC変調・復調回路
8　耐振用メモリコントローラ
9　メモリ
10　ATRAC変調・復調回路
11　ADC
12　DAC
13　出力端
14　入力端
15　システムコントローラ
15'　メモリ
16　磁気ヘッド
17　磁気ヘッド駆動回路
18　スライドモータ
19　表示部
20　DAT
21　CDプレーヤ
22　操作部

【図3】

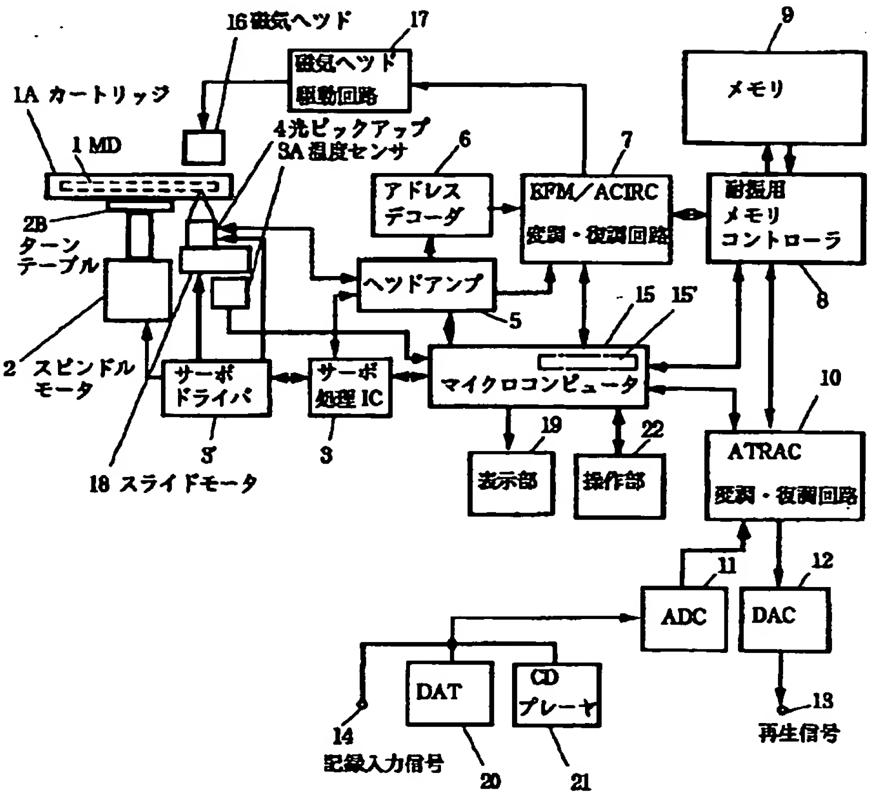
予めメモリに記憶された内容

温度	制御データ
−20〜−10	0001
−10〜0	0110
0〜10	0111
10〜20	1000
20〜30	1001
30〜40	1010
40〜50	1011

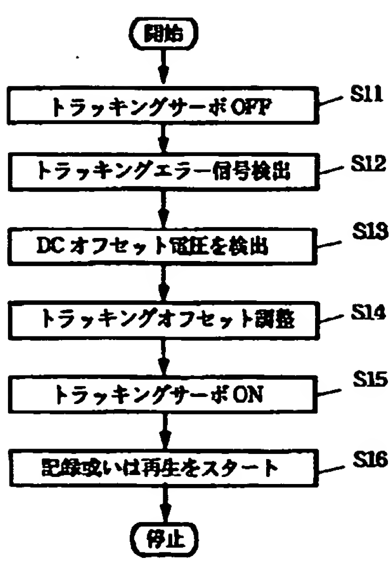
【図2】



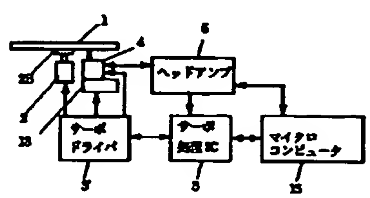
【図1】


16 磁気ヘッド
17
磁気ヘッド
駆動回路
9
メモリ
1A カートリッジ
1 MD
4 光ピックアップ
3A 温度センサ
6
アドレス
デコーダ
7
EFM／ACIRC
変調・復調回路
耐振用
メモリ
コントローラ
2B
ターン
テーブル
ヘッドアンプ
5
15
15'
8
2 スピンドル
モータ
サーボ
ドライバ
サーボ
処理 IC
マイクロコンピュータ
10
3'
3
19
22
18 スライドモータ
表示部
操作部
ATRAC
変調・復調回路
11
12
ADC
DAC
DAT
CD
プレーヤ
14
記録入力信号
20
21
13
再生信号

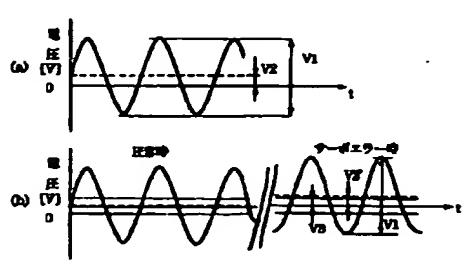
【図5】


開始
トラッキングサーボ OFF
S11
トラッキングエラー信号検出
S12
DC オフセット電圧を検出
S13
トラッキングオフセット調整
S14
トラッキングサーボ ON
S15
記録或いは再生をスタート
S16
停止

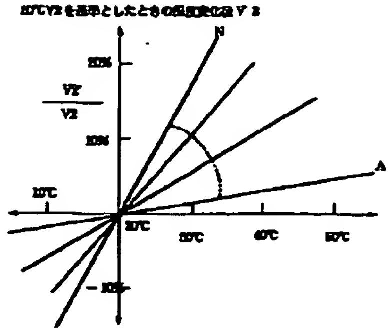
【図4】


ヘッドアンプ
サーボ
ドライバ
サーボ
処理 IC
マイクロ
コンピュータ

【図6】


(a)
電
圧
(V)
0
V1
V2
t
(b)
電
圧
(V)
0
正常時
サーボエラー時
V2
V3
V1
t

【図7】



PATENT ABSTRACTS OF JAPAN

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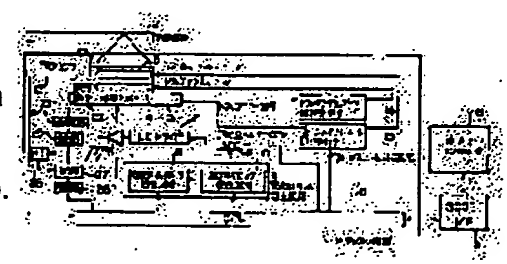
(72)Inventor : TSUCHIMOCHI YUICHI

(54) OPTICAL DISK DEVICE

(57)Abstract:

PURPOSE: To widen a margin of a recording power having a small error rate by an inexpensive and a simple constitution at the time of recording at high temp. inside a device.



CONSTITUTION: An optical disk device 1 performs information recording by making a later diode 6 to emit a pulse beam by means of a LD driver 7 and irradiating a recording medium 2 with a light beam. At this time, temp. in the vicinity of the surface of the recording medium is detected by means of a temp. sensor 12, a CPU 11 sends a focus offset setting signal to a focusing actuator driver 13 when the recording medium is at high temp. based on the detected result of temp., an offset current is superimposed on a focusing servo driving current supplied to a focusing actuator 5 and the condition of convergence of a laser beam is controlled.

LEGAL STATUS

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rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The optical disk unit characterized by providing the following An optical record means to have the optical system which condenses a laser beam to the Records Department formed in the disk-like record medium, to perform pulse luminescence of the aforementioned laser beam to it, and to record optical information on it The laser spot control means which superimpose the offset current to the focus-servo drive current supplied to the optical system of the aforementioned optical record means according to change of the record power to the record medium accompanying this temperature rise, and control in the condensing state of the aforementioned laser beam when performing the aforementioned pulse luminescence and the temperature of a record medium rises [a medium temperature detection means detect the temperature of the aforementioned record medium, and] based on the detection result of the aforementioned medium temperature detection means
[Claim 2] The aforementioned optical record means is an optical disk unit according to claim 1 characterized by making pulse width into the same length as the period of a reference clock in case the aforementioned pulse luminescence is performed.
[Claim 3] It is the optical disk unit according to claim 1 which has a means perform trial writing which the aforementioned optical record means records by changing the aforementioned record power, and sets up the optimal record power value, and the aforementioned laser spot control means carry out [setting up the optimum value of the aforementioned offset current by the aforementioned trial writing, and superimposing the offset current of the aforementioned optimum value to the aforementioned focus-servo drive current at the time of the elevated temperature of the aforementioned record medium, and] as the feature.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the optical disk unit which records information optically to a disk-like record medium.
[0002]
[Description of the Prior Art] The optical disk unit which performs informational record reproduction to a disk-like record medium optically is developed variously in recent years. It explains, after taking for an example the case of the equipment which uses a magneto-optic disk as a record medium here as an example of an optical disk unit.
[0003] A magneto-optic disk by 130mm now 600/650MB disk (ISO/IEC10089), Two kinds of 1.2/1.3GB disks (ISO/IEC13549), By 90mm, two kinds (128MB disk (ISO/IEC10090) and 230MB disk (ECMA/TC31/93/90)), The magneto-optic disk of four kinds of **** is standardized, and the drive equipment which can record reproduce information is fed into one kind or two or more kinds of disks among these in the commercial scene.
[0004] With Magnetic-Optical disk drive equipment, an external magnetic field is impressed to a magnetic thin film with the perpendicular magnetic anisotropy currently formed on the substrate of a magneto-optic disk, pulse luminescence of the laser beam is carried out further, the temperature of the Records Department is raised to the Curie point, and record (it is hereafter called a magneto-optic recording) of an information signal is performed by changing the sense of the magnetic field of the Records Department.
[0005] Thus, in Magnetic-Optical disk drive equipment, since it is carried out by the temperature up of a magnetic thin film, in order to perform good record with few errors at the time of reproduction, with change of record conditions, such as a medium and circumference environment, a magneto-optic recording needs to change a temperature up field, and needs to generate a suitable record section (it is hereafter called a pit).
[0006] For example, by the so-called disk of the Constant Angular Velocity (130mm 600/650MB or 90mm 128MB) which fixed recording density in a hoop direction, recording density increases compared with a periphery in the inner circumference of the part which records information. For this reason, if it records over a perimeter by the same power and the same pulse width, a temperature up and since the direction change of a magnetic domain will be made and it will be superimposed as a jitter component, compared with a periphery, a latus field will become [the area of a pit] narrow the factor which the so-called error rate increases by the bird clapper by inner circumference from the field which it is actually going to record.
[0007] The record method currently indicated by JP,59-24452,A is mentioned as what solves this trouble. This changes the irradiation pulse width (it is hereafter called record pulse width) of the laser beam for record into an optical disk unit by the inside-and-outside periphery by preparing a pulse width control circuit, in order to record a signal the optimal in the disk of a Constant Angular Velocity.
[0008] However, the so-called equipment of the ZCAV method which enabled high-density record is put

in practical use by packing a pit interval all over a disk to the above-mentioned Constant Angular Velocity in recent years. By the disk (130mm 1.2/1.3GB or 90mm 230MB) of a ZCAV method, in the direction of a path of a disk, higher-density record is attained by shortening criteria channel clock length (the following, 1T, and brief sketch) as two or more fields (the following, a band, and brief sketch) of the same annular record angular velocity are prepared and it goes to a periphery for every band.

[0009] Since 1T between bands differ, it is necessary to make record pulse width change in the informational record using the disk of such a ZCAV method according to it. Moreover, also within the same band, in order to amend an error rate which was mentioned above, it is necessary to tune record pulse width finely to 1T. In the case of this amendment, since a pulse width control circuit needs to generate two or more sorts (number of bands +alpha) of pulses, the burden on hardware composition is large, and the trouble which also causes elevation of equipment cost is in it.

[0010] The equipment currently indicated by JP,7-44867,A is mentioned as what solves this trouble. In this equipment, in order to generate two or more sorts of record pulse width, the multiplication circuit which multiplies on the basis of 1T is prepared, for example, pulse width, such as 0.75T or 0.825T, is generated. The hardware composition for two or more sorts of pulse generation can be simplified, and equipment cost is also mitigated by this multiplication circuit.

[0011]

[Problem(s) to be Solved by the Invention] However, the influence by the temperature change of a medium is taken into consideration by neither with the above-mentioned conventional equipment. As mentioned above, since a magneto-optic recording is performed by the temperature rise of a magnetic thin film, change will take place to the pit on an optical magnetic medium (magnetic-domain field where magnetization is turned to the record side), and the increase in an error rate as a jitter component by the temperature gradient will also be superimposed on it by the temperature change.

[0012] Moreover, the influence by the above-mentioned temperature change affects it also to the ratio (this is outlined Following MTF as a number showing the attenuation factor of the trace amplitude of the shortest record pulse pattern) of the trace amplitude of the shortest record pulse pattern between optical disk units (for example, 2-7 modulation record three T record patterns), and the trace amplitude of the longest record pulse pattern (for example, 2-7 modulation record eight T record patterns).

[0013] In an optical disk unit, dispersion arises in the MTF value for every equipment individual according to various factors, such as dispersion by the vary and according to system of measurement measurement error by dispersion in the pulse outgoing radiation light by dispersion in matching of the HF module itself or laser, and HF module, aberration, dispersion of the laser spot on the medium side by dispersion in the size of the flare angle of a laser beam, and the polarization ratio, and the electric system.

[0014] Among these, as a key factor, the MTF value change by dispersion in a laser spot (condensing dispersion of a laser spot) is considered. In each of the longest record pulse pattern (eight T record patterns) and the shortest record pulse pattern (three T record patterns), change of the trace amplitude by change of record power is shown in drawing 4 .

[0015] although trace amplitude becomes large with the rise of record power in the longest record pulse pattern ((a) and (b) of drawing 4), in the shortest record pulse pattern ((c) and (d) of drawing 4), the resolution between record pulses falls by the rise of record power, and trace amplitude is the same as the longest record pulse pattern -- comparatively -- coming out -- it does not become large

[0016] Since a temperature up happens in the large field of a pit periphery to record compared with the case where the diameter of a laser spot is not narrowed down when the diameter of a laser spot is narrowed down sufficiently small, the fall of the resolution between record pulses becomes remarkable, and MTF decreases. therefore, in unifying the power recorded on a medium between equipment individuals The product to which Above MTF serves as the minimum, i.e., condensing of a laser spot etc. is good and the resolution of the trace amplitude of the shortest record pulse pattern falls most by the rise of record power (a following and MTF minimum article and brief sketch), MTF serves as the maximum, namely, condensing of a laser spot etc. bad with the product (a following and MTF upper limit article and brief sketch) to which the resolution of the trace amplitude of the shortest record pulse

pattern does not fall most by the rise of record power It is necessary to set up record power so that the error rate at the time of reading may both become low enough.

[0017] Since the beam spot by the laser beam is not fully narrowed down when recording on a medium in an MTF upper limit article, the record power which begins to form a pit with few error rates becomes larger than an MTF minimum article. Moreover, when recording on a medium in an MTF minimum article, the resolution between pits becomes bad and an error rate begins to fall by record power lower than an MTF upper limit article.

[0018] The relation between the record power in each of such an MTF upper limit article and an MTF minimum article and an error rate is shown in drawing 5 . Drawing 5 is the graph which plotted change of record power, and the vertical axis for the horizontal axis about an MTF upper limit article and each MTF minimum article as a degree of time margin of the data pulse in a data window (this is hereafter written as a phase margin).

[0019] At this time, the record power P required in order to obtain the margin beyond a certain fixed phase-margin value A is the intersection of the fall of P1 and an MTF minimum article about the intersection of the standup of an MTF upper limit article to A P2 If expressed, it will become P1 <=P<=P2.

[0020] The aforementioned record power P1 and P2 A relation with the temperature of a medium is shown in drawing 6 . It sets to drawing 6 and the straight line of the upper solid line is P2. The straight line of a temperature change and a lower dashed line is P1. The temperature change is shown and the field inserted into the up-and-down straight line turns into a field of the record power P where the margin beyond the fixed phase-margin value A is obtained.

[0021] Inclination will become steep from the straight line (temperature-change straight line of P1) of the bottom where the direction of a straight line (temperature-change straight line of P2) when condensing of a laser spot corresponds to a good MTF minimum article as a general inclination of this temperature characteristic straight line corresponds to an MTF upper limit article. Consequently, P1 at the time of an elevated temperature P2 A difference (deltaPb) is P1 at the time of low temperature. P2 It becomes smaller than a difference (deltaPa). Therefore, at the time of an elevated temperature, the record power field where the margin beyond the fixed phase-margin value A is obtained compared with the time of low temperature becomes narrow, and has become what has a narrow margin to power change of an optical disk unit depended unusually.

[0022] Although how to change into short pulse width is also considered by the pulse width control circuit at the time of an elevated temperature in order to solve this fault, with such composition, there is a trouble which becomes cost quantity as mentioned above.

[0023] this invention was made in view of the above-mentioned situation, and aims at offering the optical disk unit which can extend the margin of the few record power of an error rate by cheap and simple composition in record in case the interior of equipment is an elevated temperature.

[0024]

[Means for Solving the Problem] An optical record means for the optical disk unit by this invention to have the optical system which condenses a laser beam to the Records Department formed in the disk-like record medium, to perform pulse luminescence of the aforementioned laser beam, and to record optical information, A medium temperature detection means to detect the temperature of the aforementioned record medium, and when the aforementioned pulse luminescence is performed, Based on the detection result of the aforementioned medium temperature detection means, when the temperature of a record medium rises, it responds to change of the record power to the record medium accompanying this temperature rise. The offset current is superimposed to the focus-servo drive current supplied to the optical system of the aforementioned optical record means, and it has the laser spot control means which control the condensing state of the aforementioned laser beam.

[0025]

[Function] In case an optical record means performs pulse luminescence of a laser beam and optical information is recorded, based on the temperature detection result of the record medium by the medium temperature detection means, when the temperature of a record medium rises, according to change of the

record power to the record medium accompanying this temperature rise, the offset current is superimposed to the focus-servo drive current supplied to the optical system of the aforementioned optical record means, and the condensing state of the aforementioned laser beam controls by laser spot control means. The range of the record power from which the size of the record pattern recorded on a record medium turns into a size of the request according to the temperature of a record medium, and will be in a state with few error rates than a permissible dose by this spreads.

[0026]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. Drawing 1 and drawing 2 start the 1st example of this invention, and composition explanatory drawing in which drawing 1 shows the composition of the principal part of an optical disk unit, and drawing 2 are the property views showing the temperature change of the record power in the optical disk unit of this example.

[0027] By this example, it has the head for record reproduction of separation optical system, and the example of composition of the optical disk unit which performs record reproduction to record media, such as a magneto-optic disk, is explained.

[0028] an optical disk unit -- one -- a record medium -- two -- one side -- a field -- countering -- making -- having arranged -- optics -- a head -- three -- having -- **** -- a laser beam -- generating -- laser diode -- (-- LD --) -- six -- LD -- a driver -- seven -- a drive -- control -- a pulse -- luminescence -- or -- continuation -- luminescence -- carrying out -- making -- things -- it is -- optics -- a head -- three -- letting it pass -- record -- ** -- or -- reproduction -- **

[0029] The photo detector 22 which detects the reflected light from a record medium 2 is formed in the optical head 3, light is received by the photo detector 22 through the optical system of the optical head 3, and the light beam reflected from the record medium 2 is detected as optical information. Moreover, the truck actuator 4 and the focal actuator 5 for performing tracking control and focal control are formed in the optical head 3. Based on the truck error signal and the focal error signal which are obtained from the reflected light from the record medium 2 detected by the photo detector 22, this truck actuator 4 and the focal actuator 5 are driven by the driving signal from the driver 14 for truck actuators, and the driver 13 for focal actuators, respectively so that tracking and a focusing servo may follow.

[0030] CPU11 which controls the whole equipment is formed in an optical disk unit 1, and it connects with it with the host computer 16 of a high order through the SCSI (Small Computer System Interface) interface (I/F) 15. Moreover, the temperature sensor 12 which equipped about two record medium inside an optical disk unit 1 with the sensor section which detects the temperature near the medium side of a record medium 2 is arranged, and the temperature detection result by the temperature sensor 12 is sent out to CPU11.

[0031] Moreover, the record pulse generator 8 which generates the record pulse at the time of writing in information is formed, and it connects with the LD driver 7 through the APC circuit 21 which performs an output control. This record pulse generator 8 has the record data pattern generating circuit 9 and the reference clock generating circuit 10, and is constituted.

[0032] In case information is recorded on the medium side of a record medium 2, the reference clock generating circuit 10 receives the VFO signal which read the VFO field preformatted into the record medium 2 by the optical head 3, and was acquired from CPU11, and generates a reference clock synchronizing with the frequency of a VFO signal. Moreover, the record data transmitted to CPU11 through the SCSI interface 15 with the aforementioned reference clock from the host computer 16 are inputted into the record data pattern generating circuit 9 as a record data pattern in response to the suitable code modulation (2-7 modulation, one to 7 modulation, etc.) for optical record in CPU11.

[0033] The record data pattern generating circuit 9 synchronizes with a reference clock the record data pattern which received the reference clock generated in the aforementioned reference clock generating circuit 10, and was received from CPU11, and generates a record signal. This record signal is adjusted to suitable record power by the APC circuit 21 under control of CPU11, and is supplied to the LD driver 7, and a laser diode 6 drives it by the LD driver 7. Laser diode 6 carries out pulse luminescence by suitable record power by this, the light beam for record is irradiated on the medium side of a record medium 2,

and informational record is performed.
[0034] Moreover, in the latter part of the photo detector 22 of the optical head 3, the reproduction amplifier 23 for informational reproduction, a waveform equalizer 24, the plastic surgery machine 25, PLL26, a discriminator 27, and a decoder 28 are formed, and the reproduction data by which decode was carried out are sent to CPU11 at it.
[0035] In case the information recorded on the medium side of a record medium 2 is reproduced, continuation luminescence of the laser diode 6 is carried out by suitable reproduction power under control of CPU11, the light beam for reproduction is irradiated on the medium side of a record medium 2, the reflected light from a record medium 2 is received by the photo detector 22 of the optical head 3, and a regenerative signal is obtained.
[0036] After this regenerative signal is amplified with the reproduction amplifier 23, it receives wave-like plastic surgery with the plastic surgery vessel 25 through a waveform equalizer 24, and is inputted into PLL26 and a discriminator 27. Moreover, the synchronizing signal outputted from PLL26 is inputted into a discriminator 27, and a detection sign train is generated from the aforementioned regenerative signal and a synchronizing signal in a discriminator 27. And the decode of the data bit train which shows reproduction information from the aforementioned detection sign train is carried out by the decoder 28, and it is sent to CPU11.
[0037] Next, detailed operation at the time of the information record in the optical disk unit 1 of this example is explained.
[0038] Based on the temperature detection result near [by the aforementioned temperature sensor 12] the medium side, CPU11 changes time (it is hereafter called the rise time) until it reaches the peak power of the pulse (it is hereafter called a record pulse) of a record data pattern by the height of the temperature of the record film of a record medium 2, and adjusts the margin of the record power which can form the pit of the size of a few request of an error rate.
[0039] At the time of low temperature, it records by the usual record pulse, i.e., the record pulse which does not lengthen the rise time. On the other hand, at the time of an elevated temperature, the rise time of a record pulse is delayed so that the margin of the record power to which optical record is performed the optimal compared with the usual record pulse may become large.
[0040] In this example, as a means for adjusting the margin of record power From CPU11, send out a focal offset setpoint signal to the driver 13 for focal actuators, and the offset current is superimposed to the focus-servo drive current supplied to the focal actuator 5. It is made to delay the rise time of a record pulse by shifting the condensing point of a laser spot from the position of a focus just on a medium side, worsening condensing, delaying the temperature up of a medium, and decreasing the temperature up field by the laser beam intentionally.
[0041] The relation between the record power in this example and the temperature of a medium is shown in drawing 2 . Drawing 2 is the intersection of the fall of P1 and an MTF minimum article about the intersection [as opposed to / as shown in drawing 5 / a certain predetermined phase-margin value A] of the standup of an MTF upper limit article P2 It carries out and the temperature change of record power is shown like drawing 6 . Here, it is P1 and P2. P1 ' and P2 ' show the record power at the time of receiving and superimposing the offset current. P1 The field across which it faced in each temperature-change straight line of P2, P1 ', and P2 ' turns into a field of the record power P where the margin beyond the fixed phase-margin value A is obtained.
[0042] If condensing of a laser spot is worsened, the record power for forming the part and pit where condensing becomes bad will shift to the higher one in parallel at the whole. However, P1 with condensing bad from the first It compares with the shift amount of a temperature-change straight line, and is P2 with sufficient condensing. Since the influence of aggravation of condensing of the direction of a temperature-change straight line is large, a shift amount increases, and the field of the power permitted as a result increases. Namely, P1 at the time of an elevated temperature P2 It is the difference of deltaPb, P1 ', and P2 ' about a difference P1 at the time of deltaPb ' and low temperature P2 If the difference of deltaPa, P1 ', and P2 ' is made into deltaPa ' for a difference, it will become deltaPa <deltaPa ' and deltaPb <deltaPb '.

[0043] However, since the margin of the record power obtained even if it uses a means to delay the rise time of the record pulse of this example at the time of low temperature, by balance with the outgoing radiation marginal power of the laser to be used as shown in drawing 2 does not become so large, the effect which mainly extends the margin of the few record power of an error rate at the time of an elevated temperature is acquired.
[0044] Thus, in case the margin of record power is adjusted, according to a temperature change, measure the relation between the amount of defocusing of a record pulse, and a phase margin beforehand, it is made to contrast with the temperature change of the phase margin in a normal state, and the amount of defocusing from which the margin of record power is obtained most is set up at the time of information record. The error rate of the pit recorded when some record power change arose by dust having adhered to the abnormalities of an optical disk unit, for example, an objective lens, and record power having fallen by this etc. can be stopped to the minimum.
[0045] According to this example, the following effects are acquired as explained above.
[0046] Although the bound of the few record power of an error rate will become narrow and a margin will become small by the temperature rise of an optical disk medium in the first place, even if it can extend the margin of record power and change takes place to record power by the abnormalities of an optical disk unit by superimposing the offset current on focus-servo drive current, the pit where an error rate is low can be formed.
[0047] Since the margin of error rate low record power can be extended at the time of an elevated temperature, without changing the pulse width of a record pulse into the second from criteria channel clock length (period of a reference clock), it is possible for it not to be necessary to prepare a pulse width control circuit etc., and for circuitry to turn into little and simple composition, and for it to be cheap-alike and to carry out.
[0048] Next, the 2nd example of this example is explained. Drawing 3 is composition explanatory drawing showing the composition of the principal part of the optical disk unit concerning the 2nd example.
[0049] In an elevated temperature, the field of the low record power of an error rate can be set as a wide range thing by using the composition of this example mentioned above when having recorded information on a record medium and the so-called trial writing which power is changed beforehand and sets up optimal record power was performed.
[0050] The 2nd example explains the example of composition of an optical disk unit with a means to perform the aforementioned trial writing.
[0051] The optical disk unit 31 of the 2nd example changes a reversion system in the composition of the 1st example shown in drawing 1. The composition of other portions is the same as that of the 1st example, gives the same sign to the same component, and omits explanation.
[0052] In the optical disk unit 31, the input scanner 42 which switches the regenerative signal by which tries and writes and a direct output is carried out from the reproduction amplifier 23 in the time of execution and normal operation, and the signal through the waveform equalizer 24 is formed in the latter part of the reproduction amplifier 23. Moreover, the comparison distinction machine 43 which compares the difference in in the pattern and the detection sign train outputted from a discriminator 27 sent to the record data pattern generating circuit 9 from CPU41 is formed in the latter part of a discriminator 27 by trying and writing.
[0053] Although record of the information on a record medium 2 is performed like the 1st example, in case it tries and writes, directions of each trial writing power for changing record power to the APC circuit 21 gradually, and recording it on it from CPU41, are sent.
[0054] Moreover, at the time of informational reproduction, it passes along the optical head 3, and it is led to a photo detector 22, light is received, and the reflected light from a record medium 2 is changed into a regenerative signal. After this regenerative signal is amplified with the reproduction amplifier 23, it is divided into two and another side is inputted into the direct-input change machine 42 for one side through a waveform equalizer 24 at an input scanner 42, respectively. At the time of trial writing execution, a signal is switched so that the signal in which a direct output is carried out by the input

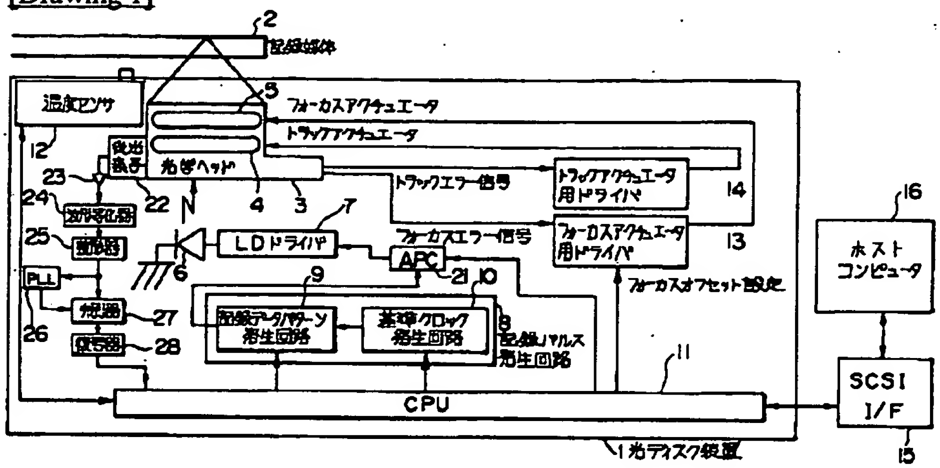
scanner 42 from the reproduction amplifier 23 may be outputted to the latter plastic surgery machine 25.
[0055] The output signal from an input scanner 42 receives wave-like plastic surgery with the plastic surgery vessel 25, and is inputted into PLL26 and a discriminator 27. Moreover, the synchronizing signal outputted from PLL26 is inputted into a discriminator 27, and a detection sign train is generated from the aforementioned regenerative signal and a synchronizing signal in a discriminator 27. And the decode of the data bit train which shows reproduction information from the aforementioned detection sign train is carried out by the decoder 28, and it is sent to CPU41.
[0056] Moreover, the detection sign train generated by the discriminator 27 is sent also to the comparison distinction machine 43. The comparison distinction machine 43 compares a difference with the detection sign train which is sent to the record data pattern generating circuit 9 from CPU41 and which tries and writes, inputs a pattern and is outputted from a discriminator 27. Based on this comparison result, CPU41 sets up the value of record power so that the difference between a record sign train and a reproduction sign train may decrease most.
[0057] At this time, CPU11 performs trial writing based on the temperature detection result near [by the temperature sensor 12] the medium side, changing the rise time of a record pulse with the temperature of a record medium 2.
[0058] When the temperature detection result near the medium side is low temperature, trial writing is performed only by changing record power. On the other hand, when the temperature detection result near the medium side is an elevated temperature, in case trial writing is performed, a focal offset setpoint signal is sent out to the driver 13 for focal actuators from CPU41, changing the offset current superimposed on focus-servo drive current, it tries simultaneously, and writes and power is changed.
[0059] Although the field of the low record power of an error rate changes with change of the focal offset current at this time, what can take the field of record power broadly most is memorized to CPU41 as a focal offset value of the optimal record pulse. Furthermore, it memorizes to CPU41 by making central value of the aforementioned field into the optimal record power.
[0060] And in the case of record to a record medium 2, the aforementioned focal offset value and record power are directed in the driver 13 for focal actuators, and the APC circuit 21 from CPU41.
[0061] Thus, the error rate of the pit recorded when abnormalities occurred in an optical disk unit when trying and writing and performing record of the long time after an end by setting up a focal offset value and record power, and superimposing the offset current on focus-servo drive current when a record medium is an elevated temperature (for example, when performing a complete format etc.), and record power changed can be stopped to the minimum.
[0062] Since the optimal record power called for by the aforementioned trial writing has a certain amount of error, a latus power margin is needed. Since the field which can set up record power at the time of an elevated temperature can be extended with the composition of this example, in the equipment which performs such trial writing, it is effective.
[0063] thus, in addition to the effect of the 1st example, in trial writing at the time of an elevated temperature, the field of the low record power of an error rate can be set up most broadly, and, according to this example, the effect that the error rate of a record pit can be stopped to change of record power to the minimum is acquired also in the state where trial writing cannot be performed by prolonged record etc. after that
[0064] As the above example explained, in this example, in the state where the margin of the record power of an optical disk unit decreased, a margin can be extended and the low record pulse of an error rate can be recorded on a medium side irrespective of change of the record power of an optical disk unit by the temperature change of a record medium. Moreover, since special circuits, such as a pulse width control circuit which controls two or more pulse width, are not needed for the composition for extending the margin of record power, are simple and also let cost be a cheap equipment configuration.
[0065]
[Effect of the Invention] As explained above, according to this invention, in record in case the interior of equipment is an elevated temperature, there is an effect it is ineffective to it being possible to extend the margin of the few record power of an error rate by cheap and simple composition.

[Translation done.]

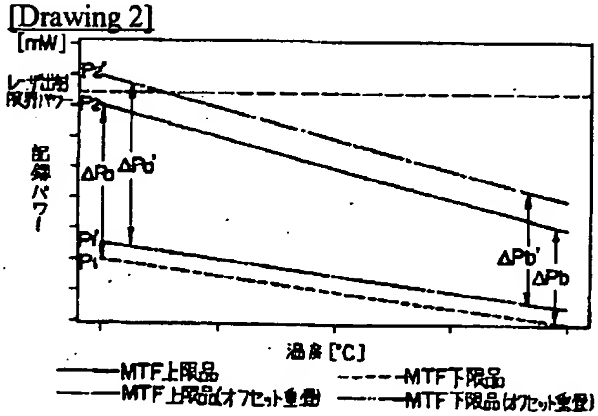
* NOTICES *

DRAWINGS

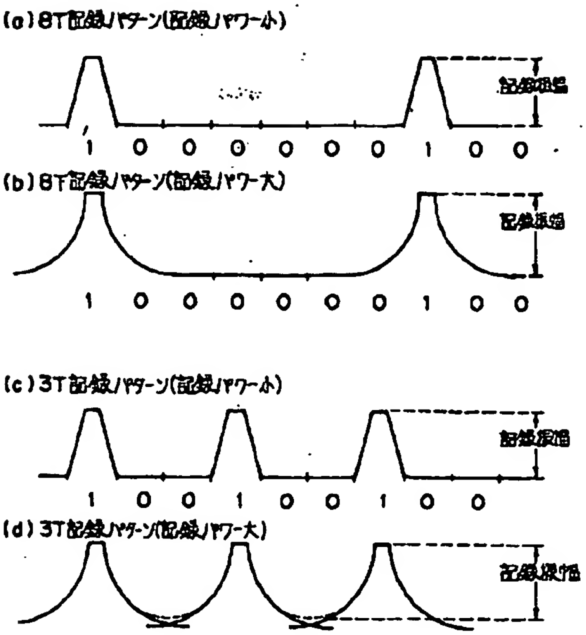
[Drawing 1]



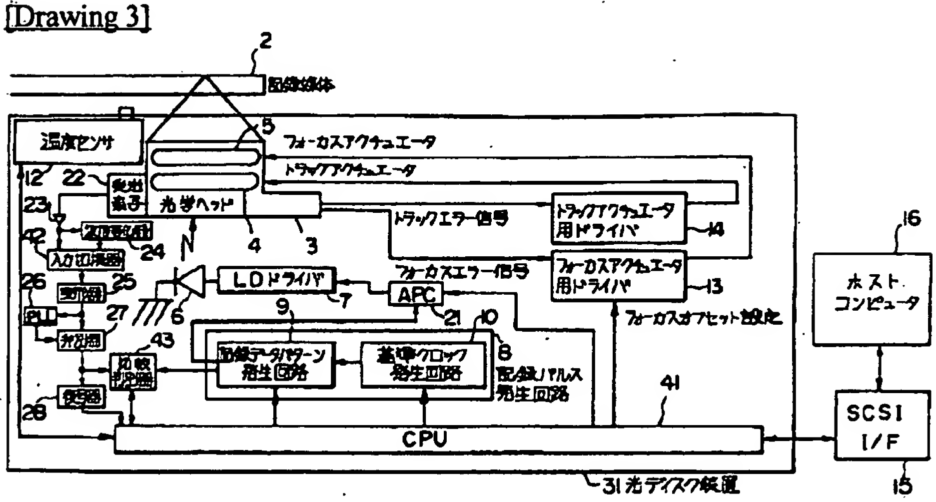
[Drawing 2]



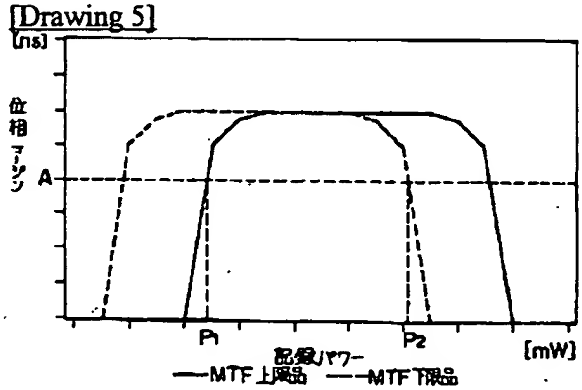
[Drawing 4]



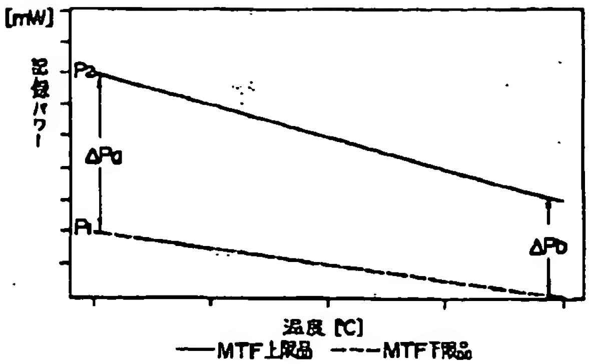
[Drawing 3]



[Drawing 5]



[Drawing 6]



[Translation done.]

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	7/125				7/125	C	
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審査請求　未請求　請求項の数3　ＯＬ　（全 8 頁）

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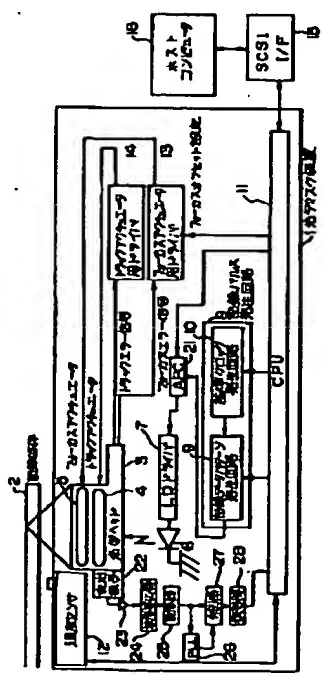
(54)【発明の名称】　光ディスク装置

(57)【要約】

【目的】　装置内部が高温であるときの記録において、安価かつ単純な構成によりエラーレートの少ない記録パワーのマージンを広げられるようにする。

【構成】　光ディスク装置1は、ＬＤドライバ7によりレーザダイオード6をパルス発光させることで記録媒体2に光ビームを照射して情報の記録を行う。このとき、温度センサ12により記録媒体面近傍の温度を検出し、この温度検出結果に基づき、ＣＰＵ11は、記録媒体2が高温の時にはフォーカスアクチュエータ用ドライバ13にフォーカスオフセット設定信号を送出し、フォーカスアクチュエータ5へ供給するフォーカスサーボ駆動電流に対してオフセット電流を重畳して、レーザ光の集光状態を制御する。



【特許請求の範囲】
【請求項1】　ディスク状の記録媒体に形成された記録部にレーザ光を集光する光学系を有し、前記レーザ光のパルス発光を行って光学情報を記録する光学記録手段と、
前記記録媒体の温度を検出する媒体温度検出手段と、
前記パルス発光を行う際、前記媒体温度検出手段の検出結果に基づき、記録媒体の温度が上昇した場合にこの温度上昇に伴う記録媒体に対する記録パワーの変化に応じて、前記光学記録手段の光学系に供給するフォーカスサーボ駆動電流に対してオフセット電流を重畳し、前記レーザ光の集光状態を制御するレーザスポット制御手段と、
を備えたことを特徴とする光ディスク装置。
【請求項2】　前記光学記録手段は、前記パルス発光を行う際に、パルス幅を基準クロックの周期と同じ長さにすることを特徴とする請求項1に記載の光ディスク装置。
【請求項3】　前記光学記録手段は、前記記録パワーを変化させて記録を行って最適な記録パワー値を設定する試し書きを行う手段を有し、
前記レーザスポット制御手段は、前記試し書きによって前記オフセット電流の最適値を設定し、前記記録媒体の高温時に前記フォーカスサーボ駆動電流に対して前記最適値のオフセット電流を重畳することを特徴とする請求項1に記載の光ディスク装置。
【発明の詳細な説明】
【0001】
【産業上の利用分野】本発明は、ディスク状の記録媒体に対して光学的に情報の記録を行う光ディスク装置に関する。
【0002】
【従来の技術】ディスク状の記録媒体に光学的に情報の記録再生を行う光ディスク装置が近年種々開発されている。光ディスク装置の一例として、ここでは光磁気ディスクを記録媒体として用いる装置の場合を例にとって以降の説明を行う。
【0003】現在、光磁気ディスクは、130㎜で600/650MBディスク（ISO/IEC10089），1．2/1．3GBディスク（ISO/IEC13549）の2種類、90㎜で128MBディスク（ISO/IEC10090），230MBディスク（ECMA/TC31/93/90）の2種類、の計4種類の光磁気ディスクが規格化されており、これらのうち、1種類あるいは複数種類のディスクに情報を記録再生可能なドライブ装置が市場に投入されている。
【0004】光磁気ディスクドライブ装置では、光磁気ディスクの基板上に成膜されている垂直磁気異方性を持つ磁性薄膜に外部磁界を印加し、さらにレーザ光をパルス発光して記録部の温度をキュリー点まで上昇させて、記録部の磁界の向きを変更することにより情報信号の記録（以下、光磁気記録と呼ぶ）が行われる。
【0005】このように光磁気ディスクドライブ装置においては、光磁気記録は磁性薄膜の昇温によって行われるため、再生時のエラーが少ない良好な記録を行うには、媒体や周囲環境などの記録条件の変更に伴い、昇温領域を変更して適切な記録領域（以下、ピットと呼ぶ）を生成する必要がある。
【0006】例えば、周方向での記録密度を一定にしたいわゆるCAV方式（130㎜　600/650MB、あるいは90㎜　128MB）のディスクでは、情報を記録する部位の内周では外周に比べて記録密度が増加する。このため同一パワー、同一パルス幅で全周にわたって記録を行うと、外周に比べ内周でピットの面積が狭くなることにより、実際に記録しようとしている領域よりも広い領域が昇温、磁区方向変更され、ジッタ成分として重畳されることになるため、いわゆるエラーレートが増加する要因となる。
【0007】この問題点を解決するものとして、特開昭59−24452号公報に開示されている記録方法が挙げられる。これは、CAV方式のディスクにおいて信号を最適に記録するために、光ディスク装置にパルス幅制御回路を設けることにより、内外周で記録用レーザ光の照射パルス幅（以下、記録パルス幅と呼ぶ）を変更するものである。
【0008】しかしながら、近年上記CAV方式に対して、ディスク全面でピット間隔を詰めることによって高密度記録を可能としたいわゆるZCAV方式の装置が実用化されている。ZCAV方式のディスク（130㎜　1．2/1．3GB、あるいは90㎜　230MB）では、ディスクの径方向において、環状の同一記録角速度の領域（以下、バンドと略記）を複数設け、バンド毎に外周へいくに従い基準チャネルクロック長（以下、1Tと略記）を短くすることにより、より高密度な記録を達成している。
【0009】こうしたZCAV方式のディスクを用いた情報の記録においては、バンド間での1Tが異なっているために、それに応じて記録パルス幅を変更させる必要がある。また同一バンド内でも、上述したようなエラーレートの補正を行うために、記録パルス幅を1Tに対して微調整する必要がある。この補正の際に、パルス幅制御回路によって複数種（バンド数＋α）のパルスを生成する必要があるため、ハードウェア構成上の負担が大きく、装置コストの上昇も招く問題点がある。
【0010】この問題点を解決するものとして、特開平7−44867号公報に開示されている装置が挙げられる。この装置においては、複数種の記録パルス幅を生成するために、1Tを基準として逓倍を行う逓倍回路を設け、例えば0．75T、あるいは0．825Tといったパルス幅を生成するようになっている。この逓倍回路に

よって、複数種のパルス生成のためのハードウェア構成を簡易化でき、装置コストも軽減される。

【0011】

【発明が解決しようとする課題】しかしながら、上記従来の装置では、いずれも媒体の温度変化による影響が考慮されていない。上述したように、光磁気記録は磁性薄膜の温度上昇によって行われるため、温度変化により、光磁気媒体上のピット（磁化が記録側に向けられている磁区領域）に変化が起こり、温度差によるジッタ成分としてのエラーレート増加も重畳されてしまう。

【0012】また、上記温度変化による影響は、光ディスク装置間の最短記録パルスパターン（例えば2－7変調記録では、3T記録パターン）の記録振幅と最長記録パルスパターン（例えば2－7変調記録では、8T記録パターン）の記録振幅との比率（これを、最短記録パルスパターンの記録振幅の減衰率を表す数字として、以下MTFと略記する）に対しても影響を与える。

【0013】光ディスク装置では、HFモジュールそのもの、あるいはレーザとHFモジュールのマッチングのばらつきによるパルス出射光のばらつき、収差、レーザ光の拡がり角の大きさのばらつきによる媒体面上でのレーザスポットのばらつき、偏光比によるばらつき、測定系による測定誤差、電気系によるばらつき等、様々の要因によって、装置個体毎のMTF値にばらつきが生じる。

【0014】このうち主要因として、レーザスポットのばらつき（レーザスポットの集光ばらつき）によるMTF値の変化について考えてみる。最長記録パルスパターン（8T記録パターン）と最短記録パルスパターン（3T記録パターン）のそれぞれにおいて記録パワーの変化による記録振幅の変化を図4に示す。

【0015】最長記録パルスパターン（図4の（a）及び（b））では、記録振幅は記録パワーの上昇に伴い大きくなるが、最短記録パルスパターン（図4の（c）及び（d））では、記録パワーの上昇により記録パルス間での分解能が低下し、記録振幅は最長記録パルスパターンと同じ割合では大きくならない。

【0016】レーザスポット径が充分小さく絞り込まれている場合は、レーザスポット径が絞り込まれていない場合に比べ、記録するピット周辺部の広い領域で昇温が起こるため、記録パルス間での分解能の低下が著しくなり、MTFが減少する。従って、装置個体間で媒体に記録するパワーを統一する場合には、上記MTFが最小となる、すなわちレーザスポットの集光等が良好で最短記録パルスパターンの記録振幅の分解能が記録パワーの上昇により最も低下する製品（以下、MTF下限品と略記）と、MTFが最大となる、すなわちレーザスポットの集光等が悪く最短記録パルスパターンの記録振幅の分解能が記録パワーの上昇により最も低下しない製品（以下、MTF上限品と略記）とで、共に読み取り時のエラーレートが充分に低くなるように記録パワーを設定する必要がある。

【0017】MTF上限品で媒体に記録をする場合、レーザ光によるビームスポットが充分に絞り込まれていないため、エラーレートの少ないピットを形成し始める記録パワーが、MTF下限品よりも大きくなる。またMTF下限品で媒体に記録をする場合、ピット間の分解能が悪くなり、MTF上限品よりも低い記録パワーでエラーレートが低下し始める。

【0018】このようなMTF上限品とMTF下限品のそれぞれにおける記録パワーとエラーレートの関係を図5に示す。図5は、横軸を記録パワーの変化、縦軸をデータウィンドウ内のデータパルスの時間的余裕度（以下、これを位相マージンと略記する）として、MTF上限品，MTF下限品それぞれについてプロットしたグラフである。

【0019】このとき、ある一定の位相マージン値A以上のマージンを得るために必要な記録パワーPは、Aに対するMTF上限品の立上りの交点を $P1$ 、MTF下限品の立下がりの交点を $P2$ で表すと、

$P1 \leqq P \leqq P2$

となる。

【0020】前記記録パワー $P1$ ，$P2$ と媒体の温度との関係を図6に示す。図6において、上の実線の直線が $P2$ の温度変化、下の破線の直線が $P1$ の温度変化を示しており、上下の直線に挟まれた領域が、一定の位相マージン値A以上のマージンが得られる記録パワーPの領域となる。

【0021】この温度特性直線の一般的な傾向として、レーザスポットの集光が良好であるMTF下限品に対応する上の直線（$P2$ の温度変化直線）の方が、MTF上限品に対応する下の直線（$P1$ の温度変化直線）よりも勾配が急峻なものとなる。この結果、高温時の $P1$ と $P2$ の差（ΔPb）が低温時の $P1$ と $P2$ の差（ΔPa）より小さくなる。従って、高温時には、低温時に比べ一定の位相マージン値A以上のマージンが得られる記録パワー領域が狭くなり、光ディスク装置の異常によるパワー変化に対してマージンが狭いものとなっている。

【0022】この不具合を解決するために、パルス幅制御回路によって高温時には短いパルス幅に変更する方法も考えられるが、このような構成では前述したようにコスト高となってしまう問題点がある。

【0023】本発明は、上記事情に鑑みてなされたもので、装置内部が高温であるときの記録において、安価かつ単純な構成によりエラーレートの少ない記録パワーのマージンを広げることが可能な光ディスク装置を提供することを目的としている。

【0024】

【課題を解決するための手段】本発明による光ディスク装置は、ディスク状の記録媒体に形成された記録部にレ

ーザ光を集光する光学系を有し、前記レーザ光のパルス発光を行って光学情報を記録する光学記録手段と、前記記録媒体の温度を検出する媒体温度検出手段と、前記パルス発光を行う際、前記媒体温度検出手段の検出結果に基づき、記録媒体の温度が上昇した場合にこの温度上昇に伴う記録媒体に対する記録パワーの変化に応じて、前記光学記録手段の光学系に供給するフォーカスサーボ駆動電流に対してオフセット電流を重畳し、前記レーザ光の集光状態を制御するレーザスポット制御手段と、を備えたものである。

【0025】

【作用】光学記録手段によりレーザ光のパルス発光を行って光学情報を記録する際に、レーザスポット制御手段により、媒体温度検出手段による記録媒体の温度検出結果に基づき、記録媒体の温度が上昇した場合にこの温度上昇に伴う記録媒体に対する記録パワーの変化に応じて、前記光学記録手段の光学系に供給するフォーカスサーボ駆動電流に対してオフセット電流を重畳し、前記レーザ光の集光状態を制御する。これにより、記録媒体に記録される記録パターンの大きさが記録媒体の温度に応じた所望の大きさとなり、エラーレートが許容量より少ない状態となる記録パワーの範囲が広がる。

【0026】

【実施例】以下、図面を参照して本発明の実施例を説明する。図1及び図2は本発明の第1実施例に係り、図1は光ディスク装置の主要部の構成を示す構成説明図、図2は本実施例の光ディスク装置における記録パワーの温度変化を示す特性図である。

【0027】本実施例では、分離光学系の記録再生用ヘッドを有し、光磁気ディスク等の記録媒体に対して記録再生を行う光ディスク装置の構成例を説明する。

【0028】光ディスク装置1は、記録媒体2の一方の面に対向させて配設した光学ヘッド3を有しており、レーザ光を発生するレーザダイオード（LD）6をLDドライバ7の駆動制御によりパルス発光あるいは連続発光させることで、光学ヘッド3を通して、記録用または再生用の光ビームを照射して記録媒体2に対して情報の書き込み、読み取りを行うようになっている。

【0029】光学ヘッド3には、記録媒体2からの反射光を検出する受光素子22が設けられており、記録媒体2より反射された光ビームは光学ヘッド3の光学系を通して受光素子22で受光され、光学情報として検出される。また、光学ヘッド3にはトラッキング制御及びフォーカス制御を行うためのトラックアクチュエータ4及びフォーカスアクチュエータ5が設けられている。このトラックアクチュエータ4及びフォーカスアクチュエータ5は、受光素子22で検出された記録媒体2からの反射光より得られるトラックエラー信号及びフォーカスエラー信号に基づき、トラッキング及びフォーカシングサーボが追従するように、それぞれトラックアクチュエータ用ドライバ14及びフォーカスアクチュエータ用ドライバ13からの駆動信号によって駆動されるようになっている。

【0030】光ディスク装置1には、装置全体の制御を行うCPU11が設けられ、SCSI（Small Computer System Interface）インターフェース（I/F）15を介して上位のホストコンピュータ16と接続されている。また、光ディスク装置1の内部の記録媒体2近傍には、記録媒体2の媒体面近傍の温度を検出するセンサ部を備えた温度センサ12が配設されており、温度センサ12による温度検出結果がCPU11へ送出されるようになっている。

【0031】また、情報の書き込みを行う際の記録パルスを発生する記録パルス発生回路8が設けられ、出力制御を行うAPC回路21を介してLDドライバ7に接続されている。この記録パルス発生回路8は、記録データパターン発生回路9及び基準クロック発生回路10を有して構成されている。

【0032】記録媒体2の媒体面上に情報の記録を行う際には、基準クロック発生回路10は、光学ヘッド3により記録媒体2にプリフォーマットされているVFO領域を読み取って得られたVFO信号をCPU11より受け取り、VFO信号の周波数に同期して基準クロックを生成する。また、記録データパターン発生回路9には、前記基準クロックと共に、ホストコンピュータ16よりSCSIインターフェース15を介してCPU11へ伝送された記録データがCPU11において光学記録に適当な符号変調（2－7変調、1－7変調等）を受けて記録データパターンとして入力される。

【0033】記録データパターン発生回路9は、前記基準クロック発生回路10で生成された基準クロックを受け取り、CPU11より受け取った記録データパターンを基準クロックに同期させ、記録信号を生成する。この記録信号は、CPU11の制御のもとでAPC回路21により適切な記録パワーに調整されてLDドライバ7に供給され、LDドライバ7によりレーザダイオード6が駆動される。これにより、レーザダイオード6が適切な記録パワーでパルス発光して記録用の光ビームが記録媒体2の媒体面上に照射され、情報の記録が行われる。

【0034】また、光学ヘッド3の受光素子22の後段には、情報の再生のための再生アンプ23、波形等化器24、整形器25、PLL26、弁別器27、復号器28が設けられ、復号された再生データがCPU11へ送られるようになっている。

【0035】記録媒体2の媒体面上に記録された情報の再生を行う際には、CPU11の制御のもとでレーザダイオード6を適切な再生パワーで連続発光させて再生用の光ビームを記録媒体2の媒体面上に照射し、記録媒体2からの反射光を光学ヘッド3の受光素子22で受光して再生信号を得る。

【0036】この再生信号は、再生アンプ23により増幅された後、波形等化器24を通り整形器25で波形の整形を受け、PLL26及び弁別器27に入力される。また、PLL26から出力される同期信号が弁別器27に入力され、弁別器27において、前記再生信号と同期信号とから検出符号列が生成される。そして、復号器28によって前記検出符号列から再生情報を示すデータビット列が復号され、CPU11へ送られる。

【0037】次に、本実施例の光ディスク装置1における情報記録時の詳細な動作について説明する。

【0038】CPU11は、前記温度センサ12による媒体面近傍の温度検出結果に基づき、すなわち記録媒体2の記録膜の温度の高低によって、記録データパターンのパルス（以下、記録パルスと呼ぶ）のピークパワーに到達するまでの時間（以下、立上り時間と呼ぶ）を変化させ、エラーレートの少ない所望の大きさのピットを形成できる記録パワーのマージンを調整する。

【0039】低温時には、通常の記録パルス、すなわち立上り時間を長くしない記録パルスにて記録を行う。一方、高温時には、通常の記録パルスに比べ光学記録が最適に行われる記録パワーのマージンが広くなるように、記録パルスの立上り時間を遅延させる。

【0040】本実施例では、記録パワーのマージンを調整するための手段として、CPU11よりフォーカスアクチュエータ用ドライバ13にフォーカスオフセット設定信号を送出し、フォーカスアクチュエータ5へ供給するフォーカスサーボ駆動電流に対してオフセット電流を重畳して、レーザスポットの集光点を媒体面上でジャストフォーカスの位置よりずらし、集光を悪くして媒体の昇温を遅延させ、意図的にレーザ光による昇温領域を減少させることにより、記録パルスの立上り時間を遅延させるようにしている。

【0041】本実施例における記録パワーと媒体の温度との関係を図2に示す。図2は、図5に示したようにある所定の位相マージン値Aに対するMTF上限品の立上りの交点をP1、MTF下限品の立下がりの交点をP2として、図6と同様に記録パワーの温度変化を示したものである。ここで、P1，P2に対してオフセット電流を重畳した場合の記録パワーをP1′，P2′で示している。P1とP2，P1′とP2′のそれぞれの温度変化直線で挟まれた領域が、一定の位相マージン値A以上のマージンが得られる記録パワーPの領域となる。

【0042】レーザスポットの集光を悪くさせると、集光が悪くなる分、ピットを形成するための記録パワーが全体に高い方へ平行にシフトする。しかしながら、元々集光の悪いP1の温度変化直線のシフト量に比べ、集光の良いP2の温度変化直線の方が集光の悪化の影響が大きいためシフト量が増加し、結果として許容されるパワーの領域が増加する。すなわち、高温時のP1とP2の差をΔPb、P1′とP2′の差をΔPb′、低温時のP1とP2の差をΔPa、P1′とP2′の差をΔPa′とすると、ΔPa<ΔPa′、ΔPb<ΔPb′となる。

【0043】ただし、図2に示すような使用するレーザの出射限界パワーとの兼ね合いにより、低温時においては本実施例の記録パルスの立上り時間を遅延させる手段を用いても得られる記録パワーのマージンはそれほど大きくならないので、主に高温時において、エラーレートの少ない記録パワーのマージンを広げる効果が得られる。

【0044】このように記録パワーのマージンを調整する際に、あらかじめ記録パルスのデフォーカス量と位相マージンとの関係を温度変化に応じて測定し、通常状態での位相マージンの温度変化と対照させて、最も記録パワーのマージンの得られるデフォーカス量を情報記録時に設定する。これにより、光ディスク装置の異常、例えば対物レンズに埃が付着し記録パワーが低下した等により、多少の記録パワー変化が生じた場合においても、記録されたピットのエラーレートを最小限に抑えることができる。

【0045】以上説明したように、本実施例によれば以下のような効果が得られる。

【0046】第一に、光ディスク媒体の温度上昇によってエラーレートの少ない記録パワーの上下限が狭くなりマージンが小さくなってしまうが、フォーカスサーボ駆動電流にオフセット電流を重畳することにより記録パワーのマージンを広げることができ、光ディスク装置の異常により記録パワーに変動が起こっても、エラーレートの低いピットを形成することができる。

【0047】第二に、記録パルスのパルス幅を基準チャネルクロック長（基準クロックの周期）から変更することなく、高温時においてエラーレート低い記録パワーのマージンを広げることができるので、パルス幅制御回路等を設ける必要がなく、回路構成は少量で単純な構成となり、安価にて実施することが可能である。

【0048】次に本実施例の第2実施例を説明する。図3は第2実施例に係る光ディスク装置の主要部の構成を示す構成説明図である。

【0049】記録媒体に情報の記録を行う際にあらかじめパワーを変化させて最適な記録パワーの設定を行う、いわゆる試し書きを行う場合においても、前述した本実施例の構成を用いることにより、高温においてエラーレートの低い記録パワーの領域を広範囲なものに設定することができる。

【0050】第2実施例では、前記試し書きを行う手段を有した光ディスク装置の構成例を説明する。

【0051】第2実施例の光ディスク装置31は、図1に示した第1実施例の構成において、再生系を変更したものである。その他の部分の構成は第1実施例と同様であり、同一構成要素には同一符号を付して説明を省略す

る。

【0052】光ディスク装置31において、再生アンプ23の後段には、試し書き実行時と通常動作時とで再生アンプ23から直接出力される再生信号と波形等化器24を通した信号とを切り換える入力切換器42が設けられている。また、弁別器27の後段には、CPU41より記録データパターン発生回路9に送られる試し書きパターンと、弁別器27より出力される検出符号列との差異を比較する比較判別器43が設けられている。

【0053】記録媒体2への情報の記録は、第1実施例と同様に行われるが、試し書きの際には、CPU41よりAPC回路21に記録パワーを徐々に変化させて記録するための各試し書きパワーの指示が送られる。

【0054】また、情報の再生時には、記録媒体2からの反射光は、光学ヘッド3を通り、受光素子22に導かれて受光され、再生信号に変換される。この再生信号は、再生アンプ23により増幅された後、2つに分けられ、一方は直接入力切換器42に、他方は波形等化器24を経て入力切換器42にそれぞれ入力される。試し書き実行時には、入力切換器42により再生アンプ23から直接出力される信号を後段の整形器25に出力するように信号が切り換えられる。

【0055】入力切換器42からの出力信号は、整形器25で波形の整形を受け、PLL26及び弁別器27に入力される。また、PLL26から出力される同期信号が弁別器27に入力され、弁別器27において、前記再生信号と同期信号とから検出符号列が生成される。そして、復号器28によって前記検出符号列から再生情報を示すデータビット列が復号され、CPU41へ送られる。

【0056】また、弁別器27で生成された検出符号列は比較判別器43にも送られる。比較判別器43は、CPU41より記録データパターン発生回路9に送られる試し書きパターンを入力し、弁別器27より出力される検出符号列との差異を比較する。この比較結果に基づき、CPU41は記録符号列と再生符号列の差異が最も少なくなるように記録パワーの値の設定を行う。

【0057】このとき、CPU11は、温度センサ12による媒体面近傍の温度検出結果に基づき、記録媒体2の温度によって記録パルスの立上り時間を変化させながら試し書きを行う。

【0058】媒体面近傍の温度検出結果が低温である場合は、記録パワーを変化させるだけで試し書きを行う。一方、媒体面近傍の温度検出結果が高温である場合は、試し書きを行う際に、CPU41よりフォーカスアクチュエータ用ドライバ13にフォーカスオフセット設定信号を送出し、フォーカスサーボ駆動電流に重畳するオフセット電流を変化させながら、同時に試し書きパワーを変化させる。

【0059】このとき、フォーカスオフセット電流の変化により、エラーレートの低い記録パワーの領域が変化するが、そのうち最も記録パワーの領域が広範囲にとれるものを最適記録パルスのフォーカスオフセット値としてCPU41に記憶する。さらに、前記領域の中心値を最適な記録パワーとしてCPU41に記憶する。

【0060】そして、記録媒体2への記録の際には、前記フォーカスオフセット値及び記録パワーをCPU41よりフォーカスアクチュエータ用ドライバ13及びAPC回路21に指示する。

【0061】このようにフォーカスオフセット値及び記録パワーを設定し、記録媒体が高温のときにはフォーカスサーボ駆動電流にオフセット電流を重畳することにより、試し書き終了後長時間の記録を行う場合、例えば全面フォーマットを行う場合などに、光ディスク装置に異常が発生して記録パワーが変化した場合においても、記録されたピットのエラーレートを最小限に抑えることができる。

【0062】前記試し書きによって求められる最適な記録パワーはある程度の誤差があるので、広いパワーマージンが必要となる。本実施例の構成では、高温時に記録パワーを設定し得る領域を広げることができるので、このような試し書きを行う装置において有効である。

【0063】このように、本実施例によれば、第1実施例の効果に加えて、高温時の試し書きにおいて、エラーレートの低い記録パワーの領域を最も広範囲に設定することができ、その後長時間記録などで試し書きが行えない状態においても、記録パワーの変化に対して記録ピットのエラーレートを最小限に抑えることができる効果が得られる。

【0064】以上の実施例で説明したように、本実施例では、記録媒体の温度変化により、光ディスク装置の記録パワーのマージンが少なくなった状態において、マージンを広げることができ、光ディスク装置の記録パワーの変化にかかわらず、媒体面にエラーレートの低い記録パルスを記録することができる。また、記録パワーのマージンを広げるための構成に、複数のパルス幅を制御するパルス幅制御回路等の特別な回路を必要としないので、簡易でコストも安価な装置構成とすることができる。

【0065】

【発明の効果】以上説明したように本発明によれば、装置内部が高温であるときの記録において、安価かつ単純な構成によりエラーレートの少ない記録パワーのマージンを広げることが可能となる効果がある。

【図面の簡単な説明】

【図1】本発明の第1実施例に係る光ディスク装置の主要部の構成を示す構成説明図

【図2】本実施例の光ディスク装置における記録パワーの温度変化を示す特性図

【図3】本発明の第2実施例に係る光ディスク装置の主

要部の構成を示す構成説明図

【図4】最長記録パルスパターンと最短記録パルスパターンのそれぞれにおける記録パワーの変化による記録振幅の変化を示す作用説明図

【図5】MTF上限品とMTF下限品のそれぞれにおける記録パワーとエラーレートの関係を示す特性図

【図6】図5における記録パワーと媒体の温度との関係を示す特性図

【符号の説明】

1…光ディスク装置

2…記録媒体

3…光学ヘッド

5…フォーカスアクチュエータ

6…レーザダイオード（LD）

7…LDドライバ

8…記録パルス発生回路

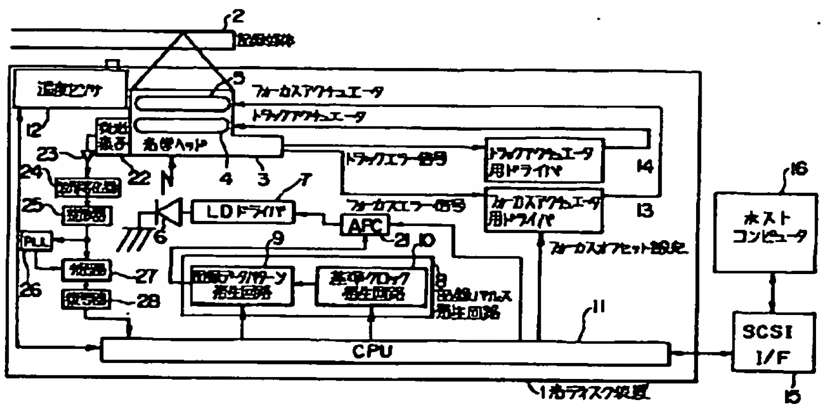
11…CPU

12…温度センサ

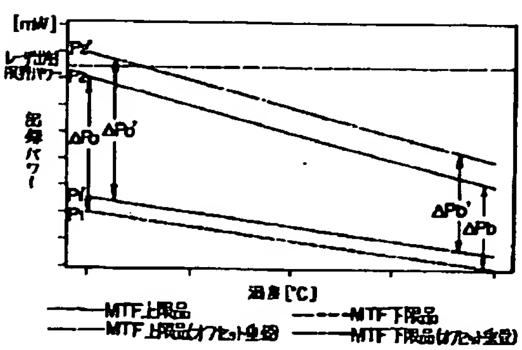
13…フォーカスアクチュエータ用ドライバ

21…APC回路

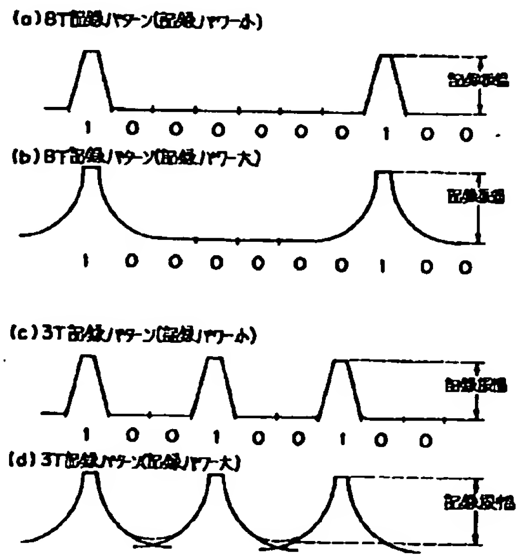
【図1】



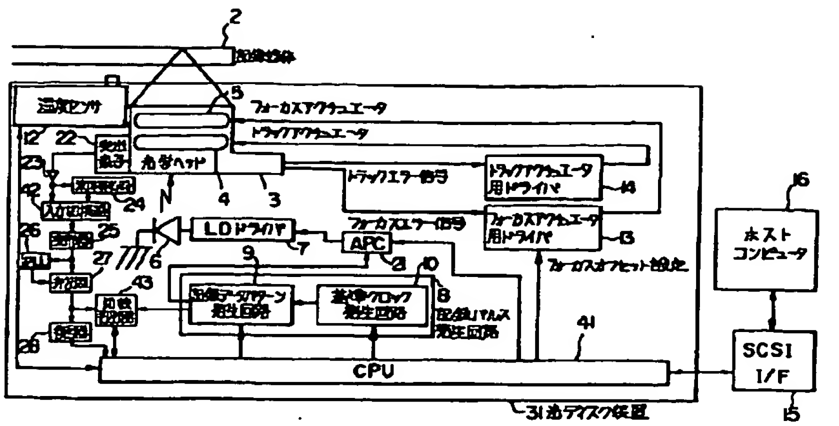
【図2】



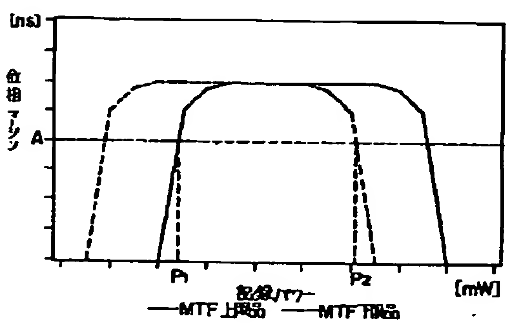
【図4】



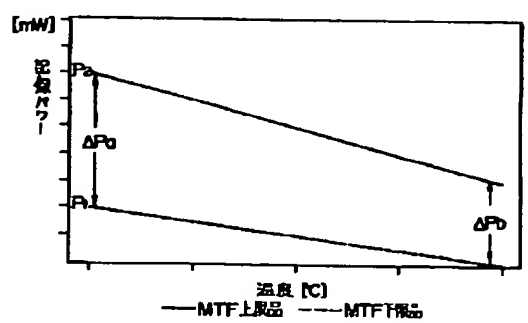
【図3】


2
5
フォーカスアクチュエータ
トラックアクチュエータ
光学ヘッド
4
3
トラックエラー信号
トラックアクチュエータ用ドライバ
14
フォーカスアクチュエータ用ドライバ
13
フォーカスエラー信号
フォーカスオフセット設定
LDドライバ
7
APC
21
6
9
10
8
記録データパターン発生回路
基準クロック発生回路
記録パルス発生回路
12
22
23
42
24
26
25
27
43
28
41
CPU
31 光ディスク装置
ホストコンピュータ
16
SCSI I/F
15

【図5】


[ns]
A
P1
P2
[mW]
—MTF上限品　----MTF下限品

【図6】


[mW]
P2
P1
ΔPa
ΔPb
温度 [℃]
—MTF上限品　----MTF下限品